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Customer No. 70001 **PATENT**

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

In re Patent Application of:
Timothy G. Curray et al.

Application No.: 09/824,493 Confirmation No.: 9371

Filed: April 2, 2001 Art Unit: 2157

For: ETHERNET COMMUNICATIONS FOR POWER MONITORING SYSTEM Examiner: Lashonda T. Jacobs

TRANSMITTAL OF APPEAL BRIEF

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NUMBER: EM000127324US
DATE: December 17, 2007
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Carla Rivera
(Carla Rivera)

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Sir:

Submitted herewith is an original of Appellants' Appeal Brief. Please charge the amount of $510.00 for the fees due in connection with the filing of the Appeal Brief under 37 C.F.R. § 41.20(b)(2) to Nixon Peabody LLP's Deposit Account 50-4181 (Attorney Docket No. 247181-000244). Please charge any other fees (except the issue fee) or credit any additional fees to Deposit Account 50-4181 (Attorney Docket No. 247181-000244).

Date: December 17, 2007

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Docket No.: SPL-32/247181-000244USPT
(PATENT)

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Carla Rivera
(Carla Rivera)

Commissioner for Patents
Mail Stop Appeal Brief - Patents
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Alexandria, VA 22313-1450

APPEAL BRIEF PURSUANT TO 37 C.F.R. § 41.37

Dear Sir:

A Notice of Appeal is being filed with this Appeal Brief. The due date for this Notice of Appeal is January 31, 2008, which is three months from the date of the Final Office Action of October 31, 2007, and the Notice of Appeal is being filed before this due date.

This Appeal Brief is filed pursuant to the Appellants' appeal to the Board of Patent Appeals and Interferences ("Board") from the final rejection of claims 1-41 in an Office Action dated October 31, 2007. The due date for this Appeal Brief is January 17, 2008, which is two months from the date of filing of the Notice of Appeal, and this Appeal Brief is being filed before this due date.

I. REAL PARTY IN INTEREST

The real party in interest is Square D Company, a corporation organized and existing under the laws of the State of Delaware, having its principal place of business at Palatine, Illinois.

II. RELATED APPEALS AND INTERFERENCES

There are no other appeals or interferences that will directly affect, be directly affected by, or have a bearing on the Board of Patent Appeals and Interferences in the present appeal.

III. STATUS OF CLAIMS

Claims 1-41 are pending and have been finally rejected, and are the subject of the present appeal. Specifically, claims 1-41 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 6,298,376 to Rosner ("Rosner") in view of U.S. Patent No. 7,181,517 to Iavergne ("Iavergne").

IV. STATUS OF AMENDMENTS

No amendments to claims 1-41 were submitted subsequent to the Final Office Action dated October 31, 2007.

V. SUMMARY OF CLAIMED SUBJECT MATTER

A. Summary Of Claimed Subject Matter

The following is a summary of the claimed subject matter as required by 37 C.F.R. 41.37(c)(1)(v).

Claim 1

The subject matter of independent claim 1 is an Ethernet communications system for a power monitoring system.

The system includes an Ethernet communication device, such as the Ethernet Communications Card ("ECC") 20 shown generally in Figs. 1 and 3-5 and in more detail in Figs. 2 and 6-7, and described generally on p. 3, ll. 28-32 through p. 4, ll. 1-16, and then in more detail throughout the remainder of the specification.

The Ethernet communication device operates in association with a power monitoring device, such as the commercially available Square D Circuit Monitor 3000/4000 series of meters 22 shown

in Figs. 1 and 3-5 and described generally on p. 3, ll. 28-32 through p. 4, ll. 1-6, and p.4, ll. 11-16, and then in more detail throughout the remainder of the specification.

The Ethernet communication device includes a processor, such as the CPU 100 shown in Fig. 2 and described on p. 5, ll. 20-32 through p. 6, ll. 1-9. The processor is capable of functioning as a master device, as described on p. 2, ll. 25-30 and p. 44, ll. 21-25 through p. 45, ll. 1-20.

The Ethernet communication device also includes a communications interface capable of gathering, under control of the processor, real-time information from one or more slave devices. The communications interface includes one or more communication ports such as the RS485 port 210 shown in Figs. 6 and 7 and described on p. 9, ll. 10-32 through p. 10, ll. 1-5, and the Ethernet ports 112 and 114 shown in Figs. 6 and 7 and described on p. 10, ll. 6-16, p. 11, ll. 1-32 and p. 12, ll. 1-8. These communication ports are capable of gathering data from multiple slave devices such as the devices 50, 52 and 54 shown connected in daisy chains in Fig. 3 and described on p. 21, ll. 12-14 and p. 9, ll. 30-32 through p. 10, ll. 1-2. The ECC 20, under control of the CPU 100, gathers real-time information from the daisy-chained slave devices, as described, for example, on p. 28, ll. 2-7, and p. 37, ll. 2-19 through p. 38, ll. 1-21. The CPU and the communications ports present the real-time information in a format useable by Hypertext Markup Language (HTML) pages, as described, for example, on p. 28, ll. 2-7.

Claim 9

The subject matter of independent claim 9 is an industrial power metering system that includes a power monitoring device, such as the commercially available Square D Circuit Monitor 3000/4000 series of meters 22 shown in Figs. 1 and 3-5 and described generally on p. 3, ll. 28-32 through p. 4, ll. 1-6 and p. 4, ll. 11-16 and then in more detail throughout the remainder of the specification.

The power monitoring device is operatively coupled with an Ethernet communication device, such as the Ethernet Communications Card ("ECC") 20 shown generally in Figs. 1 and 3-5 and in more detail in Figs. 2 and 6-7, and described generally on p. 3, ll. 28-32, through p. 4, ll. 1-16, and then in more detail throughout the remainder of the specification.

The Ethernet communication device also includes a communications interface capable of gathering, under control of the processor, real-time information from one or more slave devices. The communications interface includes one or more communication ports such as the RS485 port 210 shown in Figs. 6 and 7 and described on p. 9, ll. 10-32 through p. 10, ll. 1-5, and the Ethernet

ports 112 and 114 shown in Figs. 6 and 7 and described on p. 10, ll. 6-16, p. 11, ll. 1-32, and p. 12, ll. 1-8. These communication ports are capable of gathering data from multiple slave devices such as the devices 50, 52 and 54 shown connected in daisy chains in Fig. 3 and described on p. 21, ll. 12-14, and p. 9, ll. 30-32, through p. 10, ll. 1-2. The ECC 20, under control of the processor, gathers real-time information from the daisy-chained slave devices, as described, for example, on p. 28, ll. 2-7, and p. 37, ll. 2-19, through p. 38, ll. 1-21. The processor and the communications interface present the real-time information in a format useable by Hypertext Markup Language (HTML) pages, as described, for example, on p. 28, ll. 2-7.

The Ethernet communication device further includes a web server, such as the HTTP server described in paragraphs 84 and 85. The web server is capable of communicating through the communications interface for dynamically gathering, formatting and verifying real-time information from the power monitoring device, as described on p. 28, ll. 1-7.

Claim 17

The subject matter of claim 17 is an Ethernet communications method for a power monitoring system. The method gathers real-time information from a power monitoring device, such as the commercially available Square D Circuit Monitor 3000/4000 series of meters 22 shown in Figs. 1 and 3-5 and described generally on p. 3, ll. 28-32 through p. 4, ll. 1-6 and p. 4, ll. 11-16 and then in more detail throughout the remainder of the specification. Other examples of power monitoring devices are the daisy-chained slave devices described, for example, on p. 28, ll. 2-7 and p. 37, ll. 2-19 through p. 38, ll. 1-21.

The method presents the gathered real-time information in a format useable by Hypertext Markup Language (HTML) pages, as described, for example, on p. 28, ll. 2-7.

Claim 24

The subject matter of claim 24 is industrial power metering method that gathers information from power monitoring, such as that carried out by a power monitoring device, such as the commercially available Square D Circuit Monitor 3000/4000 series of meters 22 shown in Figs. 1 and 3-5 and described generally on p. 3, ll. 28-32, through p. 4, ll. 1-6, and p. 4, ll. 11-16 and then in more detail throughout the remainder of the specification.

The method dynamically gathers, formats, verifies and communicates real-time information from power monitoring in a format usable by Hypertext Markup Language (HTML) pages, as

described, for example, on p. 4, ll. 10-13; p. 5, ll. 14-15; p. 15, ll. 5 – p. 33, l. 24; p. 28, ll. 2-7 and p. 44, ll. 1-30.

Claim 31

The subject matter of claim 31 is an Ethernet communications system for a power monitoring system that gathers real-time information from a power monitoring device, such as the commercially available Square D Circuit Monitor 3000/4000 series of meters 22 shown in Figs. 1 and 3-5 and described generally on p. 3, ll. 28-32 through p. 4, ll. 1-6 and p. 4, ll. 11-16 and then in more detail throughout the remainder of the specification. Other examples of power monitoring devices are the daisy-chained slave devices described, for example, on p. 28, ll. 2-7 and p. 37, ll. 2-19 through p. 38, ll. 1-21.

The gathered real-time information is presented in a format useable by Hypertext Markup Language (HTML) pages, as described, for example, on p. 28, ll. 2-7.

Claim 38

The system includes an Ethernet communication device, such as the Ethernet Communications Card ("ECC") 20 shown generally in Figs. 1 and 3-5 and in more detail in Figs. 2 and 6-7, and described generally on p. 3, ll. 28-32, through p. 4, ll. 1-16, and then in more detail throughout the remainder of the specification.

The Ethernet communication device operates in association with a power monitoring device, such as the commercially available Square D Circuit Monitor 3000/4000 series of meters 22 shown in Figs. 1 and 3-5 and described generally on p. 3, ll. 28-32 through p. 4, ll. 1-6 and p. 4, ll. 11-16 and then in more detail throughout the remainder of the specification.

The Ethernet communication device includes a processor, such as the CPU 100 shown in Fig. 2 and described on p. 5, ll. 20-32, through p. 6, ll. 1-9. The processor is capable of functioning as a master device, as described on p. 2, ll. 25-30, and p. 44, ll. 21-25, through p. 45, ll. 1-20.

The Ethernet communication device also includes a communications interface capable of gathering, under control of the processor, real-time information from one or more slave devices. The communications interface includes one or more communication ports such as the RS485 port 210 shown in Figs. 6 and 7 and described on p. 9, ll. 10-32, through p. 10, ll. 1-5, and the Ethernet ports 112 and 114 shown in Figs. 6 and 7 and described on p. 10, ll. 6-16, p. 11, ll. 1-32 and p. 12, ll. 1-8. These communication ports are capable of gathering data from multiple slave devices such as the devices 50, 52 and 54 shown connected in daisy chains in Fig. 3 and described on p. 21, ll.

12-14 and p. 9, ll. 30-32 through p. 10, ll. 1-2. The ECC 20, under control of the CPU 100, gathers real-time information from the daisy-chained slave devices, as described, for example, on p. 28, ll. 2-7, and p. 37, ll. 2-19, through p. 38, ll. 1-21. The CPU 100 and the RS485 and Ethernet communication ports present the real-time information in a format useable by Hypertext Markup Language (HTML) pages, as described, for example, on p. 28, ll. 2-7.

B. Means-plus-function Elements

The following elements of claims 31-37 are means-plus-function elements and have the following corresponding structures:

Claim 31

"**means for** gathering real-time information from said power monitoring device": **corresponding structure** is the CPU 100 programmed to receive information from a power monitoring device such as the devices 50, 52 and 54 shown connected in daisy chains in Fig. 3 and described on p. 21, ll. 12-14 and p. 9, ll. 30-32 through p. 10, ll. 1-2.

"**means for** presenting said real-time information in a format useable by Hypertext Markup Language pages": **corresponding structure** is the CPU 100 programmed to display real-time data in HTML pages, as described on p. 28, ll. 1-7.

Claim 32

"**means for** gathering information from one or more slave devices": **corresponding structure** is the CPU 100 programmed to gather data from slave devices such as the devices in a RS485 daisy chain as described on p. 28, ll. 2-7.

Claim 33

"**means for** [coupling] said slave devices in a daisy chain": corresponding structures are the ports, such as the RS485 port 112 in Figs. 6 and 7, and conductors used to form a daisy chain of slave devices, such as the daisy chain of devices 52 shown in Fig. 5.

"**means for** using any of a plurality of protocols for either full duplex or half duplex communications, including SyMax, Modbus and Jbus": **corresponding structures** are connection ports and/or nodes for SyMax, Modbus or Jbus slave devices, such as the SyMax connection nodes identified in Tables 20 and 21 on pages 22 and 23, and full duplex or half duplex conductors or transmission lines, such as the full duplex fiber referred to in paragraph 69 or the half-duplex Modbus/Jbus 2-wire communications described on p. p. 45, ll. 13-20.

__Claim 34__

"dynamically formatting and verifying real-time data gathered by said gathering, using JavaScript and VB script": **corresponding structure** is the CPU 100 programmed to format and verify the gathered real-time data, such as the source code on pages 29-33.

__Claim 35__

"server **means** . . . responding to said login by generating an access token for said browser for permitting access by said browser for a predetermined amount of time": **corresponding structure** is the CPU 100 programmed to generate an access code such as the random number described on p. 15, ll. 14-28 as being generated as an "access token" that is appended to all the HTML page transactions during a session.

"**means for** accessing said server means from a web browser": **corresponding structure** is a CPU, such as the CPU 100, in which HTML pages are accessible by use of a web browser such as Internet Explorer, as described on p. 4, ll. 7-16.

__Claim 36__

"**means for** supporting dual physical Ethernet media types using a single physical interface chip": **corresponding structure** is the PHY (Physical Interface) 110 described on p. 7, 11. 3-6, p. 10, ll. 6-16 and p. 11, ll. 1-25.

__Claim 37__

"a media independent interface **means for** attachment to a 10/100 media access controller": **corresponding structure** is the 10/100 Ethernet port 112 described on p. 5, ll. 30 and 31, p. 7, ll. 3-6 and p. 10, ll. 7-11.

"**means for** directly driving an RJ45 interface and means for providing a pseudo-ECL interface for use with 100Base Fx fast fiber transceivers": **corresponding structure** is the PHY 110 that directly drives the RJ45 interface and also provides a pseudo-ECL interface for use with 100BaseFX fast fiber transceivers, as described on p. 10, ll. 6-11.

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

Claims 1-41 stand finally rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 6,298,376 ("Rosner") in view of U.S. Patent No. 7,181,517 ("Iavergne").

Claim 1: Rosner is alleged to disclose all the elements of this claim except, "Rosner does not explicitly disclose 'said processor and said communications interface further being operative for

presenting said real-time information in a format useable by Hypertext Markup Language HTML pages.'" (Final Office Action, p. 5). Rosner is combined with Iavergne, which is alleged to disclose "a browser-enabled remote user interface for telecommunications power system comprising said processor and said communications interface further being operative for presenting said real-time information in a format useable by Hypertext Markup Language HTML pages." (Final Office Action, p. 5). Iavergne is also alleged to disclose "monitoring and controlling a power system from a remote browser application in which real-time data is presented through the Internet." (Final Office Action, p. 5).

Claim 9: Rosner is alleged to disclose all the elements of this claim except, "Rosner does not explicitly disclose 'an Ethernet communications device operatively coupled with said power monitoring device; said Ethernet communications device including a processor and a communications interface; and a web server capable of communicating through said communications interface.'" (Final Office Action, p. 6). Rosner is combined with Iavergne, which is alleged to disclose "a browser-enabled remote user interface for telecommunications power system comprising an Ethernet communications device operatively coupled with said power monitoring device; said Ethernet communications device including a processor and a communications interface; and a web server capable of communicating through said communications interface." (Final Office Action, p. 6).

Claims 17 and 31: Rosner is alleged to disclose all the elements of these claims except, "Rosner does not explicitly disclose 'presenting said real-time information in a format useable by Hypertext Markup Language pages.'" Rosner is combined with Iavergne, which is alleged to disclose "a browser-enabled remote user interface for telecommunications power system comprising presenting said real-time information in a format useable by Hypertext Markup Language pages" and "monitoring and controlling a power system from a remote browser application in which real-time data is presented through the Internet." (Final Office Action, p. 6).

Claim 24: Rosner is alleged to disclose all the elements of this claim except, "Rosner does not explicitly disclose 'dynamically gathering, formatting, verifying and communicating real-time information from the power monitoring device in a format usable by HTML pages.'" (Final Office Action, p. 8). Rosner is combined with Iavergne, which is alleged to disclose "a browser-enabled remote user interface for telecommunications power system comprising dynamically gathering, formatting, verifying and communicating real-time information from the power monitoring device

in a format usable by HTML pages" and "monitoring and controlling a power system from a remote browser application in which real-time data is presented through the Internet." (Final Office Action, p. 8).

Claim 38: Rosner is alleged to disclose all the elements of this claim except, "Rosner does not explicitly disclose 'said processor and said communications interface being operative for presenting said real-time information in a format useable by Hypertext Markup Language (HTML) pages.'" (Final Office Action, p. 9). Rosner is combined with Iavergne, which is alleged to disclose "a browser-enabled remote user interface for telecommunications power system comprising said processor and said communications interface being operative for presenting said real-time information in a format useable by Hypertext Markup Language (HTML) pages" and "monitoring and controlling a power system from a remote browser application in which real-time data is presented through the Internet." (Final Office Action, p. 9).

Claims 2, 10, 18, 25 and 32: Rosner is alleged to disclose "functioning as a slave device." (Final Office Action, p. 9).

Claims 2, 10, 18, 25 and 32: Rosner is alleged to disclose "wherein said processor and said slave device are coupled, by said communications interface, in a daisy chain and wherein said Ethernet communications device is capable of using any of a plurality of protocols for either full duplex or half duplex communications, including SyMax, Modbus, and Jbus." (Final Office Action, p. 10).

Claims 4, 12, 20, 27 and 34: Rosner is alleged to disclose all the elements of these claims except, "Rosner does not explicitly disclose a server coupled with said communications interface, said server operating for sending data to a browser for dynamically formatting and verifying real-time data gathered by said processors and communications interfaces using JavaScript and VB script.'" (Final Office Action, p. 10). Rosner is combined with Iavergne, which is alleged to disclose "a browser-enabled remote user interface for telecommunications power system comprising a server coupled with said communications interface, said server operating for sending data to a browser for dynamically formatting and verifying real-time data gathered by said processors and communications interfaces using JavaScript and VB script" and "monitoring and controlling a power system from a remote browser application in which real-time data is presented through the Internet." (Final Office Action, p. 10).

Claims 5, 21, 28 and 35: Rosner is alleged to disclose all the elements of these claims except, "Rosner does not explicitly disclose a server operatively coupled with said communications interface, and further including a web browser capable of accessing said server and at least one processor in communication with said server, said web browser generating a login, and said processor responding to said login by generating an access token for said browser for permitting access by said browser for a predetermined amount of time." (Final Office Action, p. 11). Rosner is combined with Iavergne, which is alleged to disclose "a browser-enabled remote user interface for telecommunications power system comprising a server operatively coupled with said communications interface, and further including a web browser capable of accessing said server and at least one processor in communication with said server, said web browser generating a login; and said processor responding to said login by generating an access token for said browser for permitting access by said browser for a predetermined amount of time" and "monitoring and controlling a power system from a remote browser application in which real-time data is presented through the Internet." (Final Office Action, p. 11).

Claims 6, 14, 22, 29, 36 and 39: Rosner is alleged to disclose all the elements of these claims except, "Rosner does not explicitly disclose 'a single physical interface chip capable of supporting dual physical Ethernet media types.'" (Final Office Action, p. 12). Rosner is combined with Iavergne, which is alleged to disclose "a browser-enabled remote user interface for telecommunications power system comprising a single physical interface chip capable of supporting dual physical Ethernet media types." (Final Office Action, p. 12).

Claims 7, 15, 23, 30, 37 and 40: Rosner is alleged to disclose all the elements of these claims except, "Rosner does not explicitly disclose 'a fast Ethernet transceiver which provides a media independent interface for attachment to a 10/100 media access controller, and is capable of directly driving an N45 interface through magnetics and termination resistors and also provides a pseudo-ECL interface for use with 100Base Fx fast fiber transceivers.'" (Final Office Action, p. 12-13). Rosner is combined with Iavergne, which is alleged to disclose "a browser-enabled remote user interface for telecommunications power system comprising a fast Ethernet transceiver which provides a media independent interface for attachment to a 10/100 media access controller, and is capable of directly driving an N45 interface through magnetics and termination resistors and also provides a pseudo-ECL interface for use with 100Base Fx fast fiber transceivers." (Final Office Action, p. 12-13).

Claims 8, 16 and 41: Rosner is alleged to disclose all the elements of these claims except, "Rosner does not explicitly disclose 'wherein said processor includes a Hypertext Transfer Protocol (HTTP) server for facilitating communications with an internet browser.'" (Final Office Action, p. 13-14). Rosner is combined with Iavergne, which is alleged to disclose "a browser-enabled remote user interface for telecommunications power system comprising wherein said processor includes a Hypertext Transfer Protocol (HTTP) server for facilitating communications with an internet browser" and "monitoring and controlling a power system from a remote browser application in which real-time data is presented through the Internet." (Final Office Action, p. 13-14).

VII. ARGUMENT

A. The Evidence of Record

In the following argument, reference will be made to the following declarations and exhibits identified in the attached Evidence Appendix. All these declarations and exhibits were filed with responses to Office Actions prior to the Final Office Action from which this appeal is taken. Thus, all these declarations and exhibits are of record in the prosecution history of this application. Copies of all the declarations and exhibits listed below are attached hereto with identifying cover sheets and tabs for convenient reference.

First Declaration: 37 C.F.R. § 1.131 Declaration by Timothy G. Curray and Bradley A. Lazenby dated April 25, 2006 (referred to hereinafter as the "First Declaration").

Exhibit A: ECC Design Specification; and

Exhibit B: ECC Instruction Bulletin.

Second Declaration: Supplemental 37 C.F.R. § 1.131 Declaration by Timothy G. Curray and Bradley A. Lazenby dated September 25, 2006 (referred to hereinafter as the "Second Declaration").

Exhibit C: Schneider Electric/Square D news release dated July 20, 2000;

Exhibit D: Schneider Electric/Square D Sales Bulletin dated August, 2000, entitled "POWERLOGIC Ethernet Communication Card;"

Exhibit E: Square D Order Data Reports;

Exhibit F: Square D Order Data Reports;

Exhibit G: ECC Photograph;

Exhibit H: "ECC Test" document;

Exhibit I: Purchase order for optical-fiber cable; and

Exhibit J: Square D records of bug results.

Third Declaration: 37 C.F.R. § 1.131 Declaration by Timothy G. Curray and Bradley A. Lazenby dated August 13, 2007 (referred to hereinafter as the "Third Declaration").

Exhibit K: Monthly Reports;

Exhibit L: "Measurement Technical Report" dated June 9, 2000;

Exhibit M: "ECC Bezel" drawing dated June, 2000;

Exhibit N: "Overlay" drawing dated June 14, 2000; and

Exhibit O: "Final Assembly" drawing dated July 11, 2000.

B. <u>Comments in the Final Office Action Regarding the Evidence of Record</u>

Applicants will address the comments in the Final Office Action, regarding the evidence listed above, in separate sections relating to conception and due diligence. These comments in the Final Office Action are contained on pages 2-4 of that action.

1. <u>Conception</u>

The Office Action alleges that applicants have "not shown a conception of invention," and applicants do "not show how the exhibits establish conclusions of conception . . . ." These allegations are erroneous because the evidence of record proves conception of the subject matter of each of the 41 claims in this application, ***in extensive detail***, prior to June 2, 2000.

One such item of evidence is the Third Declaration, which contains the following statement by the inventors, under penalty of perjury:

> The subject matter claimed in all the pending claims 1-41 in the '493 application was conceived by us prior to June 2, 2000, in the facilities of Square D Company in LaVergne, Tennessee. Evidence of the conception is provided, for example, by the following documents [Exhibits A and K]:

Neither these statements in the Third Declaration, nor Exhibit A, nor Exhibit K, is addressed, or even mentioned, in the Final Office Action.

The Third Declaration also references the First Declaration and Exhibit A, which is discussed at length in the First Declaration. Paragraph 2 of the First Declaration explains in detail where each element of each of the claims 1-41 is disclosed in Exhibit A, which is a 60-page Design Specification for the specific product described and claimed in the present application (the "Circuit Monitor 3000/4000 Ethernet Communication Card (ECC)").

The Third Declaration establishes that the "Initial Draft Release" of Exhibit A (identified on page 2 of Exhibit A, as well as 13 of the 15 revisions listed on page 2 of the exhibit), were prepared prior to June 2, 2000. (Para. 1a of the Third Declaration). The only two revisions made after June 2, 2000 were revisions 15 and 16, which affected only very small parts of the exhibit. Rev. 15 "Updated the register list" (Exhibit A, p. 2), which is the list on pages 59-60 of Exhibit A. Rev. 16 "Updated the RS485 distances table to reflect testing results" (Exhibit A, p. 2), which is the distances table on page 11. Thus, the evidence of record shows that except for these two minor revisions, the entire Exhibit A was prepared before June 2, 2000.

Exhibit A describes all the elements of claims 1-41 of the present application, and thus clearly establishes conception of the subject matter of all 41 claims prior to June 2, 2000. Paragraph 2 of the First Declaration specifically identifies the various elements of claims 1-41 in Exhibit A, and thus conceived prior to June 2, 2000, as follows:

- the "processor" recited in independent claims 1, 2, 3, 4, 5, 8, 9, 10, 11, 12, 13, 16, 38 and 41 corresponds to the CPU shown in Figure 1 on page 8 of Exhibit A, which is the same as Fig. 2 of the '493 application;
- the "communications interface" recited in independent claims 1, 3, 4, 5, 6, 7, 9, 11, 12, 14, 15, 38, 39 and 40 corresponds to the RS485 transceivers and the 10/100 Base TX FX PHY port shown in Figure 1 on page 8 of Exhibit A, which is the same as Fig. 2 of the '493 application;
- the "slave devices" recited in independent claims 1-3, 10-11, 18-19, 25-26, 32-33 and 38 corresponds to the "slave RS485 devices" referred to on page 7 of Exhibit A;
- the "real-time information" recited in independent claims 1, 9, 17, 24, 31 and 38 corresponds to the "real time, tabular data from the attached devices" referred to on page 36 of Exhibit A;
- the "HTML pages" recited in independent claims 1, 17, 24, 31 and 38 corresponds to HTML pages referred to on pages 2, 17, 21-22, 36, 50 and 55 of Exhibit A;
- the "master device" recited in independent claims 1 and 38 corresponds to the "master" referred to on pages 7, 11, 18, 50 and 51 of Exhibit A;

- the "JavaScript" recited in claims 4, 12, 20, 27 and 34 corresponds to the JavaScript referred to on pages 37 and 40 of Exhibit A;
- the "SyMax" recited in claims 3, 11, 19, 26 and 33 corresponds to the SyMax referred to on pages 7, 38 and 51 of Exhibit A;
- the "Modbus" recited in claims 3, 11, 19, 26 and 33 corresponds to the Modbus referred to on pages 7, 16, 20, 24, 31-33, 38, 51, 53, 55 and 58-60 of Exhibit A;
- the "Jbus" recited in claims 3, 11, 19, 26 and 33 corresponds to the Jbus referred to on pages 7, 24 and 51 of Exhibit A;
- the "web browser" or "internet browser" recited in claims 5, 8, 13, 16, 21 and 41 corresponds to the web browser or internet browser referred to on pages 17, 21 and 22 of Exhibit A;
- the "login" recited in claims 5, 13, 21, 28 and 35 corresponds to the login referred to on pages 17, 31, 36 and 50 of Exhibit A;
- the "access token" recited in claims 5, 13, 21, 28 and 35 corresponds to the access token referred to on pages 17, 31 and 59 of Exhibit A;
- the "fast Ethernet transceiver" recited in claims 7,15 and 40 corresponds to the fast Ethernet transceiver referred to on page 12 of Exhibit A;
- the "10/100" recited in claims 7, 15, 23, 30, 37 and 40 corresponds to the 10/100 referred to on pages 7, 8, 10 and 12 of Exhibit A;
- the "pseudo-ECL" recited in claims 7, 15, 23, 30, 37 and 40 corresponds to the pseudo-ECL referred to on page 12 of Exhibit A;
- the "100Base" recited in claims 7, 15, 23, 30, 37 and 40 corresponds to the 100Base referred to on pages 7 and 12 of Exhibit A;
- the "daisy chain" recited in claims 3, 11, 19, 26 and 33 corresponds to the daisy chain referred to on pages 11, 20, 24 and 36 of Exhibit A;
- the "full duplex" and "half duplex" recited in claims 3, 11, 19, 26 and 33 corresponds to the full duplex and half duplex referred to on pages 1 and 51 of Exhibit A; and
- The "single physical interface chip capable of supporting dual physical Ethernet media types" recited in claims 6, 14, 22, 29, 36 and 39 corresponds

to the PHY referred to throughout Exhibit A and identified on page 14 of Exhibit A as an "IC," which means an integrated circuit or chip.

Thus, Exhibit A in combination with the inventors' statements in the First and Third Declarations establish that all the elements of claims 1-41 were conceived prior to June 2, 2000. In fact, major portions of the present application were taken verbatim from Exhibit A. For example, as set forth in paragraph 2 of the First Declaration, Figs. 2, 6, 7, 8 and 9 of the drawings of the present application correspond to Figs. 1, 2, 3 and 16 of Exhibit A. In addition, ALL the 45 tables contained in the specification of the present application are contained in Exhibit A; the specific source code set forth on pages 29-33 of the present application is contained verbatim on pages 39-41 of Exhibit A; and much of the text in the present application appears verbatim in Exhibit A.

Applicants respectfully submit that Exhibit A alone, along with the discussions of this exhibit in the First and Third Declarations, belie the allegation in the Office Action that applicants have "not shown a conception of invention." Exhibit A is not addressed in the Final Office Action, even though it is addressed in detail in the First and Third Declarations and contains extremely detailed design information for the very product described and claimed in the present application. As pointed out above, major portions of the drawings, tables and other information in the present application were taken directly from Exhibit A.

The Third Declaration also addresses Exhibit K as further evidence of conception prior to June 2, 2000, as follows:

> The attached Exhibit K is a series of Monthly Reports prepared by Tim Curray prior to June of 2000. Irrelevant portions of these reports have been redacted, and the portions not redacted relate to the development of the "Ethernet Option Module (EOM)," which was later identified as the "ECC." These reports clearly show that the ECC had been conceived before those reports were prepared, because the reports discuss advanced development work such as selection and ordering of specific components, whether to use an internal or external RAM interface, PC board layout, preparation of the final schematic and formal design specification, layout of the firmware, etc.

Thus, Exhibit K in combination with the inventors' statements in the Third Declaration confirm that the subject matter of claims 1-41 was conceived prior to June 2, 2000.

In view of the facts set forth above, applicants are bewildered by the following paragraph in the Final Office Action, which fails to even mention Exhibit A or the inventors' statements explicitly addressing conception in the declarations:

> The Examiner has reviewed the submitted evidence in its entirety and **does not find any support for conception**. For example, it is not obvious to the Examiner where the claimed "a processor capable of functioning as a master device; a communications interface capable of gathering, under control of said processor in real-time information from one or more slave devices and said processor and said communications interface further being operative for presenting said real-time information in a format useable by Hypertext Markup Language (HTML) pages" is supported by exhibits J, K, L, M, N and O. As such it appears that **Applicant has not shown a conception of invention**. This is a single example and is not meant to be comprehensive and exhaustive. **Applicants has [sic] the burden of establishing conception**. (emphasis added)

The above quotation from the Final Office Action specifically alleges, as an example, that the exhibits do not disclose "a processor capable of functioning as a master device; a communications interface capable of gathering, under control of said processor in real-time information from one or more slave devices and said processor and said communications interface further being operative for presenting said real-time information in a format useable by Hypertext Markup Language (HTML) pages." And yet, paragraph 2 of the First Declaration specifically points out where Exhibit A discloses the precise elements referred to in the Office Action," as follows:

- the "processor" recited in independent claims 1, 2, 3, 4, 5, 8, 9, 10, 11, 12, 13, 16, 38 and 41 corresponds to the CPU shown in Figure 1 on page 8 of Exhibit A, which is the same as Fig. 2 of the '493 application;
- the "communications interface" recited in independent claims 1, 3, 4, 5, 6, 7, 9, 11, 12, 14, 15, 38, 39 and 40 corresponds to the RS485 transceivers and the 10/100 Base TX FX PHY port shown in Figure 1 on page 8 of Exhibit A, which is the same as Fig. 2 of the '493 application;
- the "slave devices" recited in independent claims 1-3, 10-11, 18-19, 25-26, 32-33 and 38 corresponds to the "slave RS485 devices" referred to on page 7 of Exhibit A;
- the "real-time information" recited in independent claims 1, 9, 17, 24, 31 and 38 corresponds to the "real time, tabular data from the attached devices" referred to on page 36 of Exhibit A;
- the "HTML pages" recited in independent claims 1, 17, 24, 31 and 38 corresponds to HTML pages referred to on pages 2, 17, 21-22, 36, 50 and 55 of Exhibit A;
- the "master device" recited in independent claims 1 and 38 corresponds to the "master" referred to on pages 7, 11, 18, 50 and 51 of Exhibit A;

The Third Declaration establishes that all the portions of Exhibit A identified above were prepared prior to prior to June 2, 2000. Specifically, the Third Declaration refers to the list of

revisions to the "Initial Draft Release" and its successive revisions on page 2 of Exhibit A and states that:

> The "Initial Draft Release" and the revisions 2 through 14 of that exhibit [A] were also prepared, and are dated, prior to June 2, 2000. As can be seen from the descriptions of the revisions, the ECC was conceived prior to June 2, 2000.

The only two revisions prepared after June 2, 2000, are the last two revisions, numbers 15 and 16, which updated the register list on pages 59-60 and the RS485 distances table on page 11. The only one of these pages referenced in the above list is page 11, which is cited as one of many pages disclosing the processor, the communications interface and the master and slave devices. Also, the mere updating of the distances table on page 11 would not have changed the disclosure relied upon on page 11, i.e., the RS485 communications interface and the daisy chain having a "beginning/master" device, in any event.

In view of the evidence discussed above, applicants respectfully submit that the conclusion in the Final Office Action that applicants have "not shown a conception of invention," prior to June 2, 2000, is erroneous and should be reversed.

2. <u>Due Diligence</u>

The Final Office Action erroneously alleges that "The critical period for which diligence must be shown is just before June 2, 2000 (the effective date of the Iavergne et al reference) until April 2, 2001 the filing date of the instant application;" that applicants have made "only a general allegation of diligence;" and that "no portion of the exhibits appears to address the matter" of due diligence.

These allegations are erroneous for two reasons. First, applicants have submitted evidence that clearly establishes an ***actual*** reduction to practice prior to July 20, 2000, and thus applicants need to prove due diligence from a date prior to June 2, 2000 to only July 20, 2000. Second, applicants have submitted detailed evidence that establishes due diligence from a date prior to June 2, 2000 to July 20, 2000 (a period of only 48 days).

a. <u>The Actual Reduction To Practice</u>

The detailed statements in the Third Declaration regarding the applicants' making of an actual reduction to practice "at least as early as July 20, 2000" have been completely ignored in the Final Office Action. Paragraph 2 of the Third Declaration reads as follows:

> The subject matter claimed in all the pending claims 1-41 in the '493 application was reduced to practice by us at least as early as July 20, 2000, in the

> facilities of Square D Company in LaVergne, Tennessee. As shown by the declarations filed on April 25 and September 7, 2006, the "ECC" product embodying this invention was actually shipped to customers in August of 2000, which fact alone is evidence that the invention was reduced to practice before August of 2000. As stated in the declaration filed September 7, 2000, Square D would not have sold and shipped the ECC without having thoroughly tested the design of the final product to ensure that it would perform the functions described in the sales literature and news releases (e.g., Exhibit C to our declaration filed September 7, 2006) and in the Instruction Bulletin that accompanied each product (see, e.g., the Instruction Bulletin submitted as Exhibit B to our Declaration filed April 25, 2006). We were personally involved in such testing throughout the first eight months of 2000. Many of the tests to which the ECC was subjected prior to the first shipment are described in paragraphs 2 and 3 of our Declaration filed April 25, 2006. Those tests were carried out using test protocols established within Square D and described in an "ECC Test" document attached as Exhibit H to our declaration filed September 7, 2006. Additional evidence that the invention was reduced to practice prior to August of 2000 is set forth in our declaration filed September 7, 2006, and the exhibits accompanying that declaration.

Paragraph 3 of the Third Declaration further states:

> Exhibit C submitted with our declaration filed September 7, 2006, is a Schneider Electric/Square D news release **dated July 20, 2000**, announcing that the ECC is **"Now Available"** (i.e., as of July 20, 2000). This news release specifically mentions that the ECC allowed customers "to connect their POWERLOGIC CM4000 Circuit Monitor to their LAN/WAN system for direct Ethernet communications," that "An RS-485 Modbus master port on the ECC supports a daisy-chain of up to 31 additional devices, allowing the CM4000 with ECC to act as an Ethernet gateway for the devices," and that "Embedded HTML pages allow for easy device setup and supply real-time power system information from the CM4000 circuit monitor through a standard web browser. Similar information can also be viewed for devices daisy-chained to the ECC's onboard RS-485 port."

Thus, Exhibit C in combination with the inventors' statements in the Third Declaration establish a reduction to practice at least as early as July 20, 2000. The inventors' testimony on this fact is corroborated by Exhibits A, C, H, I, J, K, L, M, N and O, as well as the First and Second Declarations. And yet many of these exhibits are not even mentioned, much less discussed, in the Final Office Action. Nor are the First and Second Declarations, even though they were expressly cited and relied upon in the Third Declaration and are a part of the prosecution record of this application.

The failure of the Final Office Action to even acknowledge the existence of this evidence of an actual reduction to practice prior to July 20, 2000, is especially surprising in view of the fact that the same Examiner previously accepted much of this same evidence as sufficient to

support a "swearing behind" of another reference. Specifically, the First and Second Declarations and their exhibits were relied upon to swear behind U.S. Patent No. 6,961,641 to Forth et al., and the rejection based on that patent was withdrawn. The Forth patent had a filing date of November 28, 2000, but most of the evidence relied upon to swear behind the Forth patent was dated prior to July 20, 2000, as established by the Third Declaration.

In summary, applicants have established an actual reduction to practice at least as early as July 20, 2000, by an abundance of evidence that is ignored in the Final Office Action.

b. <u>The Due Diligence</u>

Having established an actual reduction to practice at least as early as July 20, 2000, applicants need to establish due diligence from a date prior to June 2, 2000 to July 20, 2000. The Final Office Action expressly acknowledges that this is the law when an actual reduction to practice is established.

Due diligence is addressed in paragraph 3 of the Third Declaration, which reads as follows:

> From at least June 1, 2000 until the reduction to practice of the subject matter claimed in all the pending claims 1-41 in the '493 application, we worked with due diligence to complete the reduction to practice. We were both employed by Square D Company in LaVergne, Tennessee, and during the months of June and July of 2000, we both spent the majority of our working hours testing and evaluating the performance of the ECC. Exhibit C submitted with our declaration filed September 7, 2006, is a Schneider Electric/Square D news release dated July 20, 2000, announcing that the ECC is "Now Available" (i.e., as of July 20, 2000). This news release specifically mentions that the ECC allowed customers "to connect their POWERLOGIC CM4000 Circuit Monitor to their LAN/WAN system for direct Ethernet communications," that "An RS-485 Modbus master port on the ECC supports a daisy-chain of up to 31 additional devices, allowing the CM4000 with ECC to act as an Ethernet gateway for the devices," and that "Embedded HTML pages allow for easy device setup and supply real-time power system information from the CM4000 circuit monitor through a standard web browser. Similar information can also be viewed for devices daisy-chained to the ECC's onboard RS-485 port." Additional evidence of our diligence in working on the reduction to practice of the ECC during June and July of 2000 is provided by the following documents:
>
> > a. Revisions 15 and 16 on page 2 of the "Design Specification" submitted as Exhibit A with our Declaration filed April 25, 2006 were prepared, and are dated, in June of 2000. Specifically, those revisions were made on June 14 and June 27, respectively.

b. Exhibit J submitted with our declaration of September 7, 2000, contains copies of exemplary Square D records of bug results after tests conducted on ECC's in June and July of 2000.

c. Attached as Exhibit L is a "Measurement Technical Report" dated June 9, 2000, for a Model CM4000 circuit monitor with ECC-63230-169-02. These tests were conducted to measure the radiated immunity of the tested equipment, which included the ECC. The report shows that the tests were conducted on June 2, 2000.

d. Attached as Exhibit M is an "ECC Bezel" drawing, dated June of 2000.

e. Attached as Exhibit N is an "Overlay" drawing of the ECC bezel, dated June 14, 2000.

f. Attached as Exhibit O is a "Final Assembly" drawing of the ECC, dated July 11, 2000.

In view of the facts set forth above, applicants respectfully submit that the following allegations in the Final Office Action are erroneous:

> Applicant has made only a general allegation of diligence and in the most recently filed affidavit no portion of the exhibits appears to address the matter. Applicants should review the guidelines for "Reasonable Diligence" found in MPEP 715.07(a) and 2138.06. Any statements should be accompanied by showings, not just pleadings (i.e. dated memos, emails, etc.).

It is respectfully submitted that paragraph 3 of the Third Declaration, quoted in full above, is more than a "general allegation of diligence." It is also respectfully submitted that the six exhibits discussed in paragraph 3 of the Third Declaration address the matter of due diligence, and that both the declaration and the exhibits amount to "showings, not just pleadings."

Exhibits A, J, L, M, N and O in combination with the inventors' statements in the First, Second and Third Declarations confirm that applicants worked with due diligence toward the reduction to practice from prior to June 2, 2000 to the actual reduction to practice that occurred prior to July 20, 2000.

C. Argument On The Rejection Of Claims 1-41 Based On 35 U.S.C. 103 <u>And The Rosner And Iavergne Patents</u>

The only rejection of claims 1-41 is based on a combination of Rosner and Iavergne, and applicants have sworn behind the Iavergne reference. Thus, Iavergne has been disqualified as a reference, and the rejection based on this reference is improper and should be reversed.

VIII. CLAIMS APPENDIX

A clean copy of claims 1-41, which are the claims involved in the appeal, is included in the Claims Appendix.

IX. EVIDENCE APPENDIX

A copy of the evidence relied upon by the appellant is included in the Evidence Appendix. A list of evidence and where each was entered in the record is also included in the Evidence Appendix.

X. RELATED PROCEEDINGS APPENDIX

As there are no related proceedings, no information is provided in the Related Proceedings Appendix.

XI. CONCLUSION

For at least the foregoing reasons, the final rejection of appealed claims 1-41 set forth in the Final Office Action mailed October 31, 2007, should be reversed.

Respectfully submitted,

Date: December 17, 2007

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CLAIMS APPENDIX

1. An Ethernet communications system for a power monitoring system, said Ethernet communications system comprising an Ethernet communication device operative in association with a power monitoring device, said Ethernet communications device including:

a processor capable of functioning as a master device;

a communications interface capable of gathering, under control of said processor real-time information from one or more slave devices;

said processor and said communications interface further being operative for presenting said real-time information in a format useable by Hypertext Markup Language (HTML) pages.[1]

2. The system of claim 1 wherein said processor is further capable of functioning as a slave device.

3. The system of claim 1 wherein said processor and said slave device are coupled, by said communications interface, in a daisy chain and wherein said Ethernet communications device is capable of using any of a plurality of protocols for either full duplex or half duplex communications, including SyMax, Modbus and Jbus.

4. The system of claim 1 said Ethernet communications device further including a server coupled with said communications interface, said server operating for sending data to a browser for dynamically formatting and verifying real-time data gathered by said processors and communications interfaces using JavaScript and VB script.

5. The system of claim 1, said Ethernet communications device further including a server operatively coupled with said communications interface, and further including a web browser capable of accessing said server and at least one processor in communication with said server, said web browser generating a login, and said processor responding to said login by generating an access token for said browser for permitting access by said browser for a predetermined amount of time.

6. The system of claim 1 wherein said communications interface comprises a single physical interface chip capable of supporting dual physical Ethernet media types.

7. The system of claim 6 wherein said communications interface device comprises a fast Ethernet transceiver which provides a media independent interface for attachment to a 10/100 media access controller, and is capable of directly driving an RJ45 interface through magnetics and

[1] As described in paragraph 0016.

termination resistors and also provides a pseudo-ECL interface for use with 100Base Fx fast fiber transceivers.

8. The system of claim 1 wherein said processor includes a Hypertext Transfer Protocol (HTTP) server for facilitating communications with an internet browser.

9. An industrial power metering system comprising:

a power monitoring device; and

an Ethernet communications device operatively coupled with said power monitoring device;

said Ethernet communications device including a processor and a communications interface capable, under control of said processor, of gathering real-time information from said power monitoring device; and a web server capable of communicating through said communications interface for dynamically gathering, formatting and verifying real-time information from the power monitoring device.

10. The system of claim 9 wherein said processor is further capable of functioning as a slave device.

11. The system of claim 9 wherein said processor and said slave device are coupled, by said communications interface in a daisy chain and wherein said Ethernet communications devices are capable of using any of a plurality of protocols for either full duplex or half duplex communications, including SyMax, Modbus and Jbus.

12. The system of claim 9 wherein said web server operates for sending data to a browser for dynamically formatting and verifying real-time data gathered by said processors and communications interfaces using JavaScript and VB script.

13. The system of claim 9 and further including a web browser capable of accessing said web server, said web browser generating a login, and said processor responding to said login by generating an access token for said browser for permitting access by said browser for a predetermined amount of time.

14. The system of claim 8 wherein said communications interface comprises a single physical interface chip capable of supporting dual physical Ethernet media types.

15. The system of claim 14 wherein said communications interface device comprises a fast Ethernet transceiver which provides a media independent interface for attachment to a 10/100 media access controller, and is capable of directly driving an RJ45 interface through magnetics and

termination resistors and also provides a pseudo-ECL interface for use with 100Base Fx fast fiber transceivers.

16. The system of claim 9 wherein said processor includes a Hypertext Transfer Protocol (HTTP) server for facilitating communications with an internet browser.

17. An Ethernet communications method for a power monitoring system, said method comprising gathering real-time information from said power monitoring device and presenting said real-time information in a format useable by Hypertext Markup Language pages.

18. The method of claim 17 wherein said gathering includes gathering information from one or more slave devices.

19. The method of claim 17 including coupling said slave devices in a daisy chain and further including using any of a plurality of protocols for either full duplex or half duplex communications, including SyMax, Modbus and Jbus.

20. The method of claim 17 and further including dynamically formatting and verifying real-time data gathered by said gathering, using JavaScript and VB script.

21. The method of claim 17, said presenting including using a server and further including accessing said server from a web browser, said web browser generating a login, and said server responding to said login by generating an access token for said browser for permitting access by said browser for a predetermined amount of time.

22. The method of claim 17 including supporting dual physical Ethernet media types using a single physical interface chip.

23. The method of claim 22 including providing a media independent interface for attachment to a 10/100 media access controller, directly driving an RJ45 interface and providing a pseudo-ECL interface for use with 100Base Fx fast fiber transceivers.

24. An industrial power metering method comprising:

monitoring power; and

gathering real-time information from said power monitoring; and

dynamically gathering, formatting, verifying and communicating real-time information from the power monitoring device in a format usable by HTML pages.

25. The method of claim 24 wherein said gathering includes gathering information from one or more slave devices.

26. The method of claim 24 including coupling said slave devices in a daisy chain and further including using any of a plurality of protocols for either full duplex or half duplex communications, including SyMax, Modbus and Jbus.

27. The method of claim 24 and further including dynamically formatting and verifying real-time data gathered by said gathering, using JavaScript and VB script.

28. The method of claim 24, said presenting including using a server and further including accessing said server from a web browser, said web browser generating a login, and said server responding to said login by generating an access token for said browser for permitting access by said browser for a predetermined amount of time.

29. The method of claim 24 including supporting dual physical Ethernet media types using a single physical interface chip.

30. The method of claim 29 including providing a media independent interface for attachment to a 10/100 media access controller, directly driving an RJ45 interface and providing a pseudo-ECL interface for use with 100Base Fx fast fiber transceivers.

31. An Ethernet communications system for a power monitoring system, said system comprising:

means for gathering real-time information from said power monitoring device; and

means for presenting said real-time information in a format useable by Hypertext Markup Language pages.

32. The system of claim 31 wherein said means for gathering includes means for gathering information from one or more slave devices.

33. The system of claim 31 including means for said slave devices in a daisy chain and further including means for using any of a plurality of protocols for either full duplex or half duplex communications, including SyMax, Modbus and Jbus.

34. The system of claim 31 and further including dynamically formatting and verifying real-time data gathered by said gathering, using JavaScript and VB script.

35. The system of claim 31, said presenting including server means and further including means for accessing said server means from a web browser, said web browser generating a login, and said server means responding to said login by generating an access token for said browser for permitting access by said browser for a predetermined amount of time.

36. The system of claim 31 including means for supporting dual physical Ethernet media types using a single physical interface chip.

37. The system of claim 36 including a media independent interface means for attachment to a 10/100 media access controller, means for directly driving an RJ45 interface and means for providing a pseudo-ECL interface for use with 100Base Fx fast fiber transceivers.

38. An Ethernet communications card apparatus for a power monitoring device, said Ethernet communications card comprising;

a processor capable of functioning as a master device;

a communications interface capable of gathering, under control of said processor real-time information from one or more slave devices;

said processor and said communications interface further being operative for presenting said real-time information in a format useable by Hypertext Markup Language (HTML) pages.

39. The apparatus of claim 38 wherein said communications interface comprises a single physical interface chip capable of supporting dual physical Ethernet media types.

40. The apparatus of claim 38 wherein said communications interface device comprises a fast Ethernet transceiver which provides a media independent interface for attachment to a 10/100 media access controller, and is capable of directly driving an RJ45 interface through magnetics and termination resistors and also provides a pseudo-ECL interface for use with 100Base Fx fast fiber transceivers.

41. The apparatus of claim 38 wherein said processor includes a Hypertext Transfer Protocol (HTTP) server for facilitating communications with an internet browser.

EVIDENCE APPENDIX

Index	Exhibits
Evidence Appendix	
First Declaration entered in the Office Action dated July 25, 2006	
ECC Design Specification	A
ECC Instruction Bulletin	B
Second Declaration entered in the Office Action dated February 9, 2007	
Schneider Electric/Square D news release dated July 20, 2000	C
Schneider Electric/Square D Sales Bulletin dated August, 2000, entitled "POWERLOGIC Ethernet Communication Card"	D
Copies of Square D Order Data Reports	E
Copies of Square D Order Data Reports	F
ECC Photograph	G
"ECC Test" document	H
Purchase order for optical-fiber cable	I
Square D records of bug results	J
Third Declaration entered in the Office Action dated October 31,2007	
Monthly Reports	K
"Measurement Technical Report" dated June 9, 2000	L
"ECC Bezel" drawing dated June, 2000	M
"Overlay" drawing dated June 14, 2000	N
"Final Assembly" drawing dated July 11, 2000	O

EVIDENCE APPENDIX

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application No. : 09/824,493
Filed : April 02, 2001

TC/A.U. : 2157
Examiner : Lashonda T. Jacobs

Docket No. : 47181-00244USPT
Customer No. : 30223

CERTIFICATE OF MAILING

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail, postage prepaid, in an envelope addressed to the Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450, on April 25, 2006.

Signature: Carla Rivera

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

37 C.F.R. § 1.131 DECLARATION

Dear Sir:

We, Timothy G. Curray and Bradley A. Lazenby, named co-inventors of pending U.S. Patent Application No. 09/824,493 ("the '493 application"), entitled "Ethernet Communications For Power Monitoring System," hereby declare:

1. We invented the subject matter of the claims of the '493 application prior to the filing date of U.S. Patent No. 6,961,641 ("the '641 patent"), which is November 28, 2000. Our '493 application was filed on April 2, 2001, which was slightly over four months after the '641 filing date.

2. The '493 application is assigned to the Square D Company, and the description and claims of the '493 application relate to a Square D product known as the Ethernet Communications Card, or "ECC." The ECC is a card for use in Square D's circuit monitor products, such as the Square D Series 3000 and Series 4000 circuit monitors, which are power monitoring equipment. The attached Exhibit A is a copy of an ECC Design Specification in which dates have been redacted, but which was prepared prior to November 28, 2000. Exhibit A is the source of much of the information contained in the '493 application including Figs. 2, 6, 7,

8 and 9 of the drawings, which correspond to Figs. 1, 2, 3 and 16, respectively, of Exhibit A. The device described in Exhibit A was reduced to practice prior to November 28, 2000, with the exception of the features described in sections 3.1.3.5 and 3.1.3.6 (pp. 27-30), 3.1.5 (pp. 34-35), 3.3 through 3.3.3.1 (pp. 43-47), 3.4 through 3. 6 and 3.7.1 (pp. 48-49). As Exhibit A was edited from time to time, the entire text was not revised each time an edit was made, and thus certain features that were actually reduced to practice prior to November 28, 2000 are referred to in the future tense, or even identified as "future," in portions of this version of the document. The portions that were reduced to practice prior to November 28, 2000 included all the elements of all the claims 1-41 in the '493 application. For example:

- the "processor" recited in independent claims 1, 2, 3, 4, 5, 8, 9, 10, 11, 12, 13, 16, 38 and 41 corresponds to the CPU shown in Figure 1 on page 8 of Exhibit A, which is the same as Fig. 2 of the '493 application;
- the "communications interface" recited in independent claims 1, 3, 4, 5, 6, 7, 9, 11, 12, 14, 15, 38, 39 and 40 corresponds to the RS485 transceivers and the 10/100 Base TX FX PHY port shown in Figure 1 on page 8 of Exhibit A, which is the same as Fig. 2 of the '493 application,
- the "slave devices" recited in independent claims 1-3, 10-11, 18-19, 25-26, 32-33 and 38 corresponds to the "slave RS485 devices" referred to on page 7 of Exhibit A;
- the "real-time information" recited in independent claims 1, 9, 17, 24, 31 and 38 corresponds to the "real time, tabular data from the attached devices" referred to on page 36 of Exhibit A,
- the "HTML pages" recited in independent claims 1, 17, 24, 31 and 38 corresponds to HTML pages referred to on pages 2, 17, 21-22, 36, 50 and 55 of Exhibit A;
- the "master device" recited in independent claims 1 and 38 corresponds to the "master" referred to on pages 7, 11, 18, 50 and 51 of Exhibit A;
- the "JavaScript" recited in claims 4, 12, 20, 27 and 34 corresponds to the JavaScript referred to on pages 37 and 40 of Exhibit A;
- the "SyMax" recited in claims 3, 11, 19, 26 and 33 corresponds to the SyMax referred to on pages 7, 38 and 51 of Exhibit A;
- the "Modbus" recited in claims 3, 11, 19, 26 and 33 corresponds to the Modbus referred to on pages 7, 16, 20, 24, 31-33, 38, 51, 53, 55 and 58-60 of Exhibit A;

- the "Jbus" recited in claims 3, 11, 19, 26 and 33 corresponds to the Jbus referred to on pages 7, 24 and 51 of Exhibit A;
- the "web browser" or "internet browser" recited in claims 5, 8, 13, 16, 21 and 41 corresponds to the web browser or internet browser referred to on pages 17, 21 and 22 of Exhibit A;
- the "login" recited in claims 5, 13, 21, 28 and 35 corresponds to the login referred to on pages 17, 31, 36 and 50 of Exhibit A;
- the "access token" recited in claims 5, 13, 21, 28 and 35 corresponds to the access token referred to on pages 17, 31 and 59 of Exhibit A;
- the "fast ethernet transceiver" recited in claims 7,15 and 40 corresponds to the fast ethernet transceiver referred to on page 12 of Exhibit A;
- the "10/100" recited in claims 7, 15, 23, 30, 37 and 40 corresponds to the 10/100 referred to on pages 7, 8, 10 and 12 of Exhibit A;
- the "pseudo-ECL" recited in claims 7, 15, 23, 30, 37 and 40 corresponds to the pseudo-ECL referred to on page 12 of Exhibit A;
- the "100Base" recited in claims 7, 15, 23, 30, 37 and 40 corresponds to the 100Base referred to on pages 7 and 12 of Exhibit A;
- the "daisy chain" recited in claims 3, 11, 19, 26 and 33 corresponds to the daisy chain referred to on pages 11, 20, 24 and 36 of Exhibit A;
- the "full duplex" and "half duplex" recited in claims 3, 11, 19, 26 and 33 corresponds to the full duplex and half duplex referred to on pages 1 and 51 of Exhibit A; and
- The "single physical interface chip capable of supporting dual physical ethernet media types" recited in claims 6, 14, 22, 29, 36 and 39 corresponds to the PHY referred to throughout Exhibit A and identified on page 14 of Exhibit A as an "IC," which means an integrated circuit or chip.

3. The attached Exhibit B is a copy of an ECC Instruction Bulletin that was prepared prior to November 28, 2000, and which is the source of certain of the information contained in the '493 application, including Figs. 1, 3, 4 and 5 of the drawings, which correspond to Figs. 4-1, 1-2, 4-5 and 4-8, respectively, of Exhibit B. The device described in Exhibit B was reduced to practice prior to November 28, 2000 and included all the elements of all the claims 1-41 in the '493 application. For example:

- the "slave devices" recited in independent claims 1-3, 10-11, 18-19, 25-26, 32-33 and 38 corresponds to the slave devices referred to on page 39 of Exhibit B;
- the gathering of "real-time information" recited in independent claims 1, 9, 17, 24, 31 and 38 corresponds to the real-time information referred to on pages 25, 35, 36, 37, 38, 39, 40, 41 and 42 of Exhibit B;
- the "HTML pages" recited in independent claims 1, 17, 24, 31 and 38 corresponds to HTML pages referred to on pages 3, 8, 9, 23, 24, 25, 26, 27, 29, 30, 31, 32, 33, 36, 37, 38, 39, 41, 44, 45 and 53 of Exhibit B;
- the "master device" recited in independent claims 1 and 38 corresponds to the "master" referred to on pages 9, 30 and 31 of Exhibit B;
- the "JavaScript" recited in claims 4, 12, 20, 27 and 34 corresponds to the JavaScript referred to on pages 37 and 40 of Exhibit B;
- the "Modbus" recited in claims 3, 11, 19, 26 and 33 corresponds to the Modbus referred to on pages 3, 27, 28, 38, 48, 49 and 52 of Exhibit B;
- the "Jbus" recited in claims 3, 11, 19, 26 and 33 corresponds to the Jbus referred to on pages 3, 27, 28 and 52 of Exhibit B;
- the "web browser" or "internet browser" recited in claims 5, 8, 13, 16, 21 and 41 corresponds to the web browser or internet browser referred to on pages 3, 8, 16, 19, 23, 24, 26, 32 and 33 of Exhibit B;
- the "login" recited in claims 5, 13, 21, 28 and 35 corresponds to the login referred to on pages 24 and 29 of Exhibit B;
- the "access token" recited in claims 5, 13, 21, 28 and 35 corresponds to the access token referred to on page 33 of Exhibit B;
- the "10/100" recited in claims 7, 15, 23, 30, 37 and 40 corresponds to the 10/100 referred to on pages 12, 19, 20 and 23 of Exhibit B;
- the "100Base" recited in claims 7,, 15, 23, 30, 37 and 40 corresponds to the 100Base referred to on pages 12, 19 and 20 of Exhibit B;
- the "daisy chain" recited in claims 3, 11, 19, 26 and 33 corresponds to the daisy chain referred to on pages 3, 8, 9, 12, 16, 17, 18, 19, 25, 26, 28, 31, 37 and 52 of Exhibit B; and

- the "full duplex" and "half duplex" recited in claims 3, 11, 19, 26 and 33 corresponds to the full duplex and half duplex referred to on pages 20, 23 and 26 of Exhibit B.

4. In view of Exhibits A and B, the subject matter of the '493 application was conceived prior to November 28, 2000, the filing date of the Forth '641 patent. Additionally, after the development of Exhibit A and Exhibit B, we continued with the internal commercial development of the technology that is the subject matter of the '493 application at least until April 2, 2001, the filing date of the '493 application.

5. In addition to our work on the technology, between November 28, 2000 and April 2, 2001, we also continued to diligently work with patent counsel on developing the patent application that resulted in the '493 application.

6. We hereby declare that all statements made herein of our own knowledge are true and that all statements made on information and belief are believed to be true; and, further, that these statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the '493 application or any patent issued thereon.

Dated: March 7, 2006

Timothy G. Curray
Timothy G. Curray

Dated: April ~~March~~ 7 2006

Bradley A. Lazenby
Bradley A. Lazenby

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SCHNEIDER NORTH AMERICA

DESIGN SPECIFICATION

Project Name: Circuit Monitor 3000/4000 Ethernet Communications Card (ECC)

Distribution:

Product Management	Design Engineering	Quality Assurance	Engineering Services
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Approvals:

Marketing Engineer		Date:	
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Product Manager		Date:	
Engineering Manager		Date:	

Rev	Revision Date	Revised by	Description
-	Thursday, August 19, 1999	TGCurray	Initial Draft Release
1	Friday, August 27, 1999	TGCurray	All references to CM3000 changed to CM3000/4000
2	Wednesday, November 17, 1999	TGCurray	All references to EOM changed to ECC
3	Thursday, November 18, 1999	TGCurray	Hardware sections updated to reflect the change to the non-5volt tolerant CPU
4	Tuesday, December 7, 1999	TGCurray	Major overhaul – included items were related to: shielded twisted pair, cost updated, hardware real-estate/layout updated, power consumption updated, password lengths increased, minor HTML page changes, MMS functionality changed to potential, inter-processor communications reworked, manufacturing parameters reworked, environmental changes, register list updated.
5	Wednesday, January 19, 2000	TGCurray	The key to components used in the Mechanical Feasibility figure was added.
6	Friday, February 18, 2000	TGCurray	Another major overhaul – included items were related to: itemization of Phase I and Future release features updated, RS485 Interface distances tables updated, mechanical feasibility drawing figure updated, HTML page flow diagram figure updated, all HTML page figures updated to reflect Marketing feedback, more details about writing custom HTML pages added, inter-processor communications logistics updated, and register list updated to reflect the addition of manufacturing parameters.
7	Thursday, March 2, 2000	TGCurray	More updates reflecting Product Marketing changes.
8	Monday, March 13, 2000	TGCurray	Minor modifications to the inter-processor communications theory of operations.
9	Tuesday, March 28, 2000	TGCurray	Modifications to the inter-processor communications boot-up sequence and the EEPROM byte offsets.
10	Thursday, March 30, 2000	TGCurray	Modifications to the inter-processor communications theory of operations
11	Monday, April 10, 2000	TGCurray	Modifications to the password HTML bit mapping table. Also the mechanical feasibility diagram was updated to reflect the RS485 wiring change.
12	Tuesday, April 11, 2000	BALazenby	Modifications to the password HTML bit mapping table.
13	Tuesday, May 16, 2000	TGCurray	Updated HTML pages to reflect Marketing changes. Also updated info in the RS485 section.
14	Thursday, May 18, 2000	TGCurray	Updated the inter-processor communications section to reflect the use of the CM's RS485 port address for MBTCP communications.
15	Wednesday, June 14, 2000	TGCurray JFowler	Updated the register list
16	Tuesday, June 27, 2000	TGCurray	Updated the RS485 distances table to reflect testing results.

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1 Introduction

The Circuit Monitor 3000/4000 series Ethernet Communications Card (ECC) will be an installable option card, which can be utilized by the Square D CM3000/4000 series of meters (CM). This option card's primary function will be to allow the meters to be accessed over Ethernet media and provide a Gateway function by allowing Ethernet access to other Square D PowerLogic compatible Modbus, Jbus, and/or SyMax slave RS485 devices. This document will attempt to be a guide and provide the necessary information for the design of the hardware and firmware required for this device. The information in this document will be continually changing during the development phases and may be somewhat general in content pertaining to some areas of the design that will be finalized later during the development process. The sections labeled with (Future) are sections describing functionality that will be deferred until after the Phase I release.

1.1 General Functionality

The following is a list of most of the functionality that will be attempted for the ECC to support and if the functionality will be implemented in Phase I or later:

1	High-speed, direct Ethernet communications to the CM the ECC is inserted into	Phase I
2	RS485 support for up to 31 PowerLogic compatible, Modbus, Jbus, and/or SyMax slave devices	Phase I
3	RS485 2 and 4-wire communications with parity as even or none up to 38.4K baud	Phase I
4	10/100baseT Ethernet twisted pair (TP) communications support	Phase I
5	100baseFX Ethernet (Fiber) communications support	Phase I
6	Access to attached slave devices from client Modbus/TCP Ethernet communications	Phase I
7	ECC setup/configuration/diagnostics by password protected HTML Ethernet communications	Phase I
8	ECC firmware download by password protected FTP Ethernet communications	Phase I
9	HTML, custom device table download by password protected FTP Ethernet communications	Future
10	Multi-lingual HTML support	Future
11	ECC setup/configuration download by password protected FTP Ethernet communications	Future
12	Access to attached devices from client MMS/TCP Ethernet communications	Future
13	Time synchronization to attached slave devices by SNTP Ethernet communications	Future
14	Ability for CM/Sub-net master initiated communications	Future

Table 1 – ECC General Functionality

2 Hardware

The following shows the ECC electrical block diagram for the hardware layout:

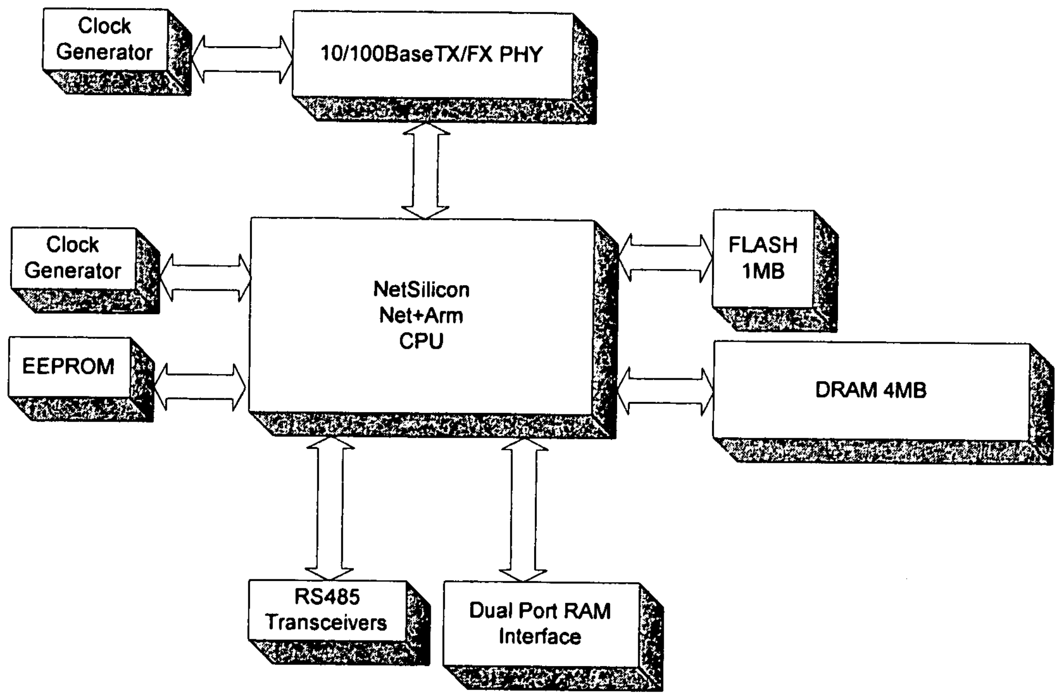


Figure 1 – ECC Electrical Block Diagram

2.1 Microprocessor

The microprocessor used for this design is the NETsilicon NET+ARM-40. This hardware architecture was developed by NETsilicon to optimize network performance. The microprocessor can run at 15MIPS (Million Instructions Per Second) but can actually reach 30MIPS peak performance with the correct peripherals and configuration of the onboard 4K cache. The internal frequency will be 33MHz driven by the external clock generator at 18.432MHz. The external bus speed will also be 33MHz. The following is a list of the main components contained in the NET+ARM chip that will be utilized in the design.

32bit 3.3V ARM7TDMI RISC Processor (not 5V tolerant)
10/100 Ethernet MAC
Glueless interface to 8, 16, and 32 bit peripherals
10 Channel DMA Controller
1 of 2 Asynchronous Serial Ports with FIFO
5 programmable chip selects
Programmable wait states
DRAM refresh controller
2 programmable timers
Programmable watchdog timer
Programmable Phase Lock Loop (PLL)
ARM embedded MULTI-ICE JTAG (not to be confused with 1149.1 JTAG Testing)

2.1.1 Chip Selects

The various peripheral devices are connected to one of the 5 programmable chip selects. These chip selects can be configured for 8, 16, or 32 bit peripherals. The following is a table of how the chip selects will be configured for use in this design.

Chip Select	Peripheral	Wait States	Start Address	Size	Width
CS0	Flash	1	0x0000000	1 Mbyte	16
CS1	DRAM RAS 1	0	0x1000000	4 Mbytes	32
CS2	-	-	-	-	-
CS3	EEPROM	4	0x2000000	8 Kbytes	8
CS4	Dual Port RAM	0	0x3000000	2 Kbyte	8

Table 2 – Chip Selects

2.1.2 Input/Output Pins

There are three ports of eight signals that can be configured to be used for either general purpose I/O bits, asynchronous serial channel signals, or interrupt inputs. Each port's signals can be configured independently. The following is a table of how the ports' signals will be used.

Signal	Type	Description
PortA0	-	Not used
PortA1	-	Not used
PortA2	-	Not used
PortA3	RXDA	Receive data serial channel A signal
PortA4	-	Not used
PortA5	RTSA	Request to send serial channel A signal
PortA6	-	Not used
PortA7	TXDA	Transmit data serial channel A signal
PortB0	-	Not used
PortB1	-	Not used
PortB2	-	Not used
PortB3	-	Not used
PortB4	-	Not used
PortB5	-	Not used
PortB6	-	Not used
PortB7	-	Not used
PortC0	Interrupt Input	External interrupt input signal for the Ethernet PHY
PortC1	Output	Output signal for serial channel A transmit LED
PortC2	Output	Output signal for serial channel A receive LED
PortC3	Interrupt Input	External interrupt input signal for the dual port RAM
PortC4	HDRS	Hardware reset output signal for soft resets
PortC5	Input	Optional Ethernet fiber transceiver detection input signal
PortC6	Input	Ethernet link input status signal
PortC7	-	Not used

Table 3 – Input/Output Pins

2.1.3 Fast Media Access Controller (MAC)

The NET+ARM has an integrated 10/100Mbit Media Access Controller (MAC) for Media Independent Interfaces (MII). This interface will be utilized in conjunction with an external Fast Ethernet PHY (Physical Interface) to allow for 10/100Mbit TP and 100Mbit Fiber communications.

2.2 Memory

Memory is commonly referred to as volatile and non-volatile types. The ECC will be designed using memory peripherals of both types. It will have 4Mbytes of DRAM and 2Kbytes of Dual Port RAM. Both of these peripherals are of the volatile memory type. It will also have 1Mbytes of Flash and 8Kbytes of EEPROM. Both of these peripherals are of the non-volatile memory type. The following table shows the memory ranges for the peripherals used in the design of the ECC.

Peripheral	Type	Size	Memory Range
Program Storage Flash	Non-Volatile	1Mbytes	0x0000000 – 0x00F9FFF
Program Execution/Stack DRAM	Volatile	4Mbytes	0x1000000 – 0x13E7FFF
Configuration storage EEPROM	Non-Volatile	8Kbytes	0x2000000 – 0x2001FFF
Inter-processor Communications DPRAM	Volatile	2Kbytes	0x3000000 – 0x30007FF

Table 4 – Memory Map

2.2.1 Flash

The Flash peripheral will be used for program (firmware) storage. At boot-up, the program code will be copied into DRAM for fast execution. The Flash will be an 8Mbit (512K x 16) part with an access time of 90ns.

2.2.2 DRAM

The DRAM peripherals will be used for program execution, stack space, and firmware downloads. There will be two 16Mbit (1M x 16) DRAM peripherals with access times of 50ns. These two peripherals will be used together to allow for 32bit wide data bus accesses by the processor. This combination of bus size and fast access speeds will allow for maximum execution of the processor with zero wait states.

2.2.3 EEPROM

The EEPROM peripheral will be used for limited configuration storage relevant to each particular ECC. Probably, the most important information will be the Ethernet Media Access Controller (MAC) address. The EEPROM will be a 64Kbit (8K x 8) part with an access time of 200ns.

2.2.4 Dual Port RAM

The dual port RAM peripheral will be used for the high-speed inter-processor communications between the ECC and the CM3000/4000 series devices. The dual port RAM will be a 16Kbit (2K x 8) part with an access time of 55ns. This speed will allow us to access this peripheral with no wait states at the full speed of the processor.

2.3 Other Peripherals and Components

There are a few other peripherals and components that are required to complete the ECC. These peripherals complement the processor and memory to allow for the fulfillment of all the functional requirements needed.

2.3.1 RS485 Interface

The RS485 communications interface will be a 4-wire plus shield interface (Tx+, Tx-, Rx+, Rx-, and Shld). This interface will have electrical isolation to internal circuitry up to 7500Vac(pk) for duration of one second or less by means of optical isolation and DC-to-DC converter. The transceiver used is protected against 15kV electrostatic discharge (ESD) shocks using the Human Body Model. Also, the transceiver features reduced slew-rate drivers that minimize Electromagnetic Interference (EMI) and reduce reflections caused by improperly terminated cables.

The connector used to wire into this interface will be a 5-point screw type commonly known as a "Phoenix" or "Terminal Block" connector (same as the one used on Power Meter devices).

Like all RS485 daisy chains, correct biasing is required to ensure reliable communications. Traditionally, a Multipoint Communications Adapter (MCA) is used at the beginning/master of the daisy chain. This adapter circuitry will be built into the ECC so no adapter will be needed externally. This internal biasing is calculated based on the daisy chain always being terminated and on using cabling with a 120 ohm impedance characteristic (Belden cable 9842). Also, RS485 daisy chain termination is required to ensure reliable communications. The last device on the daisy chain usually needs to have a Multipoint Communications Terminator (MCT). Ideally, the last device on the daisy chain should have a termination resistor of 120 ohms across its receive plus and minus pair only.

The RS485 interface will be designed to support up to 31 slave RS485 4-wire devices. The "guaranteed" maximum number of devices capable of being supported on a single daisy chain is determined based on the relation of baud rate, the length of the daisy chain, and the types of slave RS485 devices (2-wire/4-wire). The RS485 interface will support daisy chains that fall within the following specifications.

4-Wire*

Baud Rate	Max distance for 1-16 devices	Max distance for 17-32 devices
1200	10,000ft (3,048m)	10,000ft (3,048m)
2400	10,000ft (3,048m)	5,000ft (1,524m)
4800	10,000ft (3,048m)	5,000ft (1,524m)
9600	10,000ft (3,048m)	4,000ft (1,219m)
19200	5,000ft (1,524m)	2,500ft (762m)
38400	5,000ft (1,524m)	1,500ft (457m)

Table 5 – 4-wire RS485 Distances

2-Wire*

Baud Rate	Max distance for 1-8 devices	Max distance for 9-16 devices
1200	10,000ft (3,048m)	10,000ft (3,048m)
2400	10,000ft (3,048m)	5,000ft (1,524m)
4800	10,000ft (3,048m)	5,000ft (1,524m)
9600	10,000ft (3,048m)	4,000ft (1,219m)
19200	5,000ft (1,524m)	2,500ft (762m)
38400	5,000ft (1,524m)	1,500ft (457m)

Table 6 - 2-wire RS485 Distances

* Due to the volume of RS485 devices in the field, these tables are only to be used as a guide and were tabulated based on PowerLogic 4-wire devices and PowerLogic 4-wire devices which are capable of doing 2-wire.

2.3.2 Fast Ethernet Physical (PHY) Transceiver Interface

The Fast Ethernet Transceiver (PHY) provides a Media Independent Interface (MII) for easy attachment to the 10/100 Media Access Controller (MAC) which is integrated into the NET+ARM processor. The PHY is capable of directly driving an RJ45 interface through magnetics and termination resistors. The PHY also provides a pseudo-ECL interface for use with 100BaseFX fast fiber transceivers.

2.3.3 10/100BaseTX Interface (RJ45)

The RJ45 interface uses two signal pairs (one for transmit and one for receive) and a center tap for the transmit transformer. These same signal pairs, magnetics, and termination resistors are used for both 10Mbit and 100Mbit operation. This interface can drive a twisted pair cable up to 100m (328ft) in length when using data grade twisted-pair wire that has a characteristic impedance of 100 ohms and meets the EIA/TIA Category Five standard wire specifications.

The cable used can be either shielded twisted pair (STP) or unshielded twisted pair (UTP). Great care should be taken here to not use IBM type 1 cabling, which is STP at 150 ohm. In the past, STP meant IBM 150 ohm cabling. Today, there is Cat 5 shielded cabling which is 100 ohm. In the USA, the cable type used is usually unshielded, in Europe it is often shielded. Most shielded 4pair cables used today are 100 ohm, either with overall foil shield (FTP) or individually shielded pairs within a braided sheath (ScTP). Most of the industry appears to be going to ScTP.

The RJ45 interface is capable of auto negotiation for speed and duplex mode. If the link partner is also capable of auto negotiation, the two devices will exchange Fast Link Pulse (FLP) bursts to communicate their capabilities to each other. The highest common capabilities of the two will then be agreed upon. If the link partner is not capable of auto negotiation, the partner will be transmitting either 10Mbits Normal Link Pulses (NLP) or 100Mbit idle symbols. The RJ45 interface will detect either NLPs or Idle symbols and will automatically configure itself to match the speed but only in half-duplex mode.

The magnetics used here are determined by the requirements of the Fast Ethernet Physical (PHY) transceiver. The required magnetics will be a transformer module with a "transmit turns ratio" of 1:1.

2.3.4 Fast Fiber Transceiver

The Fast Fiber Transceiver is compliant with the optical performance requirements of the physical layer of the 100BaseFX version of the IEEE 802.3u specifications. This specification is defined as the FDDI PMD Standard ISO/IEC 9314-3:1990 and ANSI X3.166-1990.

The transceiver has a duplex LC connector receptacle and is compatible with 1300nm wavelength multimode fiber connections. It is optimized for 62.5 or 50/125 micron multimode graded index glass optical fiber per TIA-568A and ISO 11801. Also, the transceiver is capable of signal integrity up to 2000m in length of multimode full duplex fiber.

A few things to note, there is no industry standard for auto-negotiation on 100BaseFX. To use this interface, the user will have to force this mode by means of the setup interface. During development though, we may be able to possibly come up with a way to auto-negotiate to 100BaseFX with logic in the Firmware. Also, this interface does not support 10FL (10Mbits fiber) applications.

This component is the most expensive one in the design. The expense is so great that the board will be designed to have the ability to detect if this component is present or not. This will allow for the manufacture of two types of boards if needed. The primary board will have the fast fiber transceiver populated and will allow for the use of the twisted pair or the fiber interface. The secondary board will not have the fast fiber transceiver populated and will allow for the use of only the twisted pair interface.

2.3.5 Light Emitting Diodes (LEDs)

There will be two tri-level LED indicators. One will be of color green/green/yellow (Tri-level 1), and the other one will be of color yellow/green/yellow (Tri-level 2). The following table shows what each individual LED represents.

Unit and Color	Description
Tri-level 1 green	Power is being received from the source (CM)
Tri-level 1 green	RS485 Transmit in progress
Tri-level 1 yellow	RS485 Receive in progress
Tri-level 2 yellow	Ethernet link good
Tri-level 2 green	Ethernet Transmit in progress
Tri-level 2 yellow	Ethernet Receive in progress

Table 7 – LED Descriptions

2.3.6 Circuit/Processor Reset

The overall circuit board power is kept in check by a voltage monitor. This device monitors three vital system conditions. It monitors the 5-volt supply from the CM, the 3.3-volt supply from the CM, and the external override/reset controlled by the CM.

When an out-of-tolerance condition is detected on either of the voltages, this device will reset the board. This capability helps ensure against firmware corruption and other "flaky" operations that occur due to out-of-tolerance power events.

Also, this device will allow an easy way for the CM to be able to control the board in the need of a reset.

2.4 Power Supply

The ECC will not have its own power supply. The ECC will receive its power requirements from the CM it is inserted into. The CM will need to supply +5Vdc and +3.3Vdc to the ECC through the Option slot connectors. The amount of the supply should be based on the following feasibility study.

Quantity	Description	Typical Power (mW)	Maximum Power (mW)
1	Fast Fiber LC Connector	165	165
1	IC, NETA 40-3	330	495
1	IC, Altima PHY	280.5	330
1	IC, 8 Mbit Flash Memory	49.5	99
2	IC, 1M x 16 (16-MBIT) DRAM	957	1056
1	IC, 8K x 8 EEPROM	0.165	26.4
1	IC, 1K x 8 Dual-Port RAM	247.5	297
1	Crystal, 18.432MHZ SMT		
1	Crystal, 25MHZ SMT		
1	Microprocessor Reset	0.25	0.25
3	Opto Isolator	375	600
1	DC/DC Converter	400	625
1	RS485 Dual Driver/Receiver	0.6	5
1	Single Port Xformer		
1	PCB RJ-45 Shielded Jack		
1	Tri-Level LED		
1	Tri-Level LED		
1	5 Position Terminal Plug		
1	5 Position Terminal Plug		
1	Connector 48Pin Eurocard		
1	Misc Passive/PCB	49.5	108.9
	Twisted Pair Only Total >	*2690.015*	*3642.55*
	Total >	*2855.015*	*3807.55*
	3.3V Burden Total >	*2079.165*	*2577.3*
	5V Burden Total >	*775.85*	*1230.25*

Table 8 – ECC Estimated Power Consumption

2.5 Mechanical

The size and dimensions of the ECC has already been pre-determined by the specifications of the option slots in the CM. The following is a feasibility study of what the final board will potentially look like.

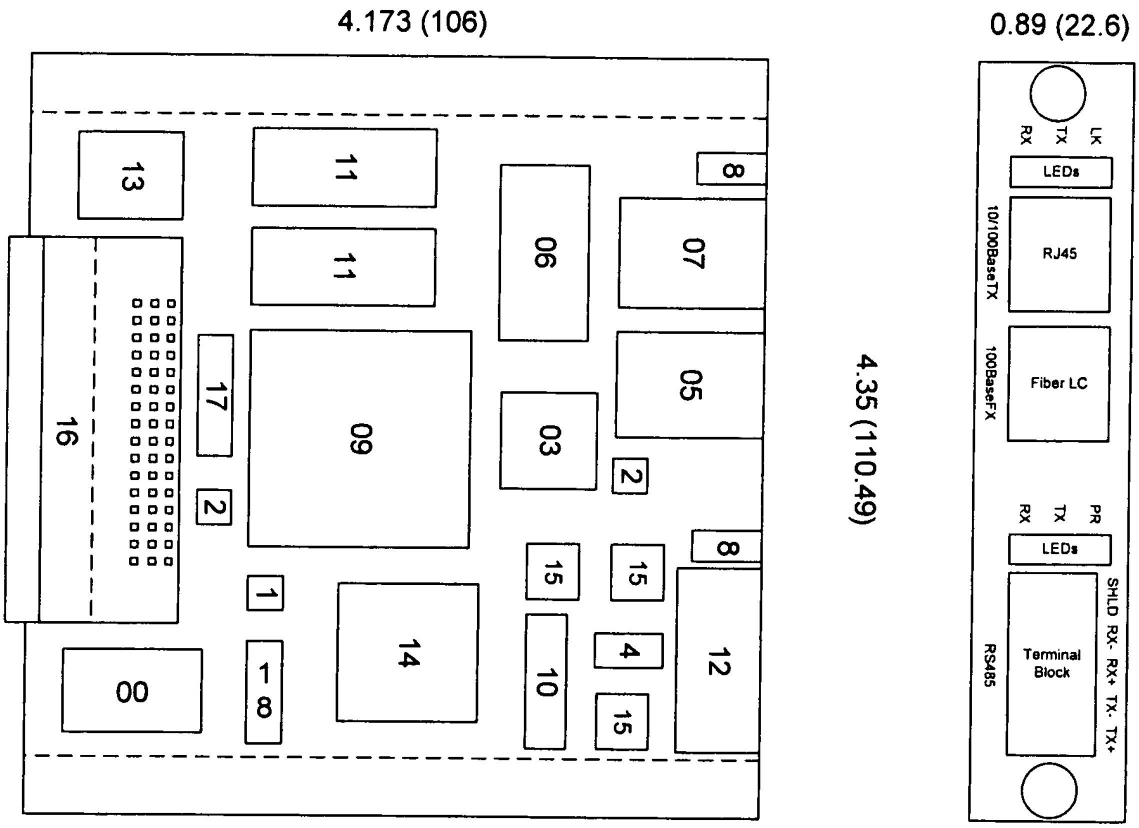


Figure 2 – Mechanical Feasibility Drawing

Key #	Quantity	Component	Key #	Quantity	Component
00	1	Flash	10	1	DC to DC
01	1	Reset	11	2	Dram
02	2	Crystal	12	1	Terminal Block
03	1	PHY	13	1	EEProm
04	1	RS485	14	1	Dual Port Ram
05	1	Fiber	15	3	Optocouplers
06	1	Transformer	16	1	Eurocard Connector
07	1	RJ45	17	1	Jtag Connector
08	2	LEDs	18	1	Bus Switch
09	1	CPU			

Table 9 – Component Key for Mechanical Feasibility Drawing

2.6 ECC Estimated RAW Component Costs

The following is a breakdown listing based on raw quoted component costs.

Quantity	Description	Price Each	Total
1	Fast Fiber LC Transceiver	$45.230	$45.23
1	IC, Net+Arm CPU	$22.950	$22.95
1	IC, Altima PHY	$4.150	$4.15
1	IC, 8 Mbit Flash Memory	$13.810	$13.81
2	IC, 1M x 16 (16-MBIT) DRAM	$4.500	$9.00
1	IC, 8K x 8 EEPROM	$6.250	$6.25
1	IC, 2K x 8 Dual-Port RAM	$6.050	$6.05
1	Crystal, 18.432MHZ SMT	$0.640	$0.64
1	Crystal, 25MHZ SMT	$0.824	$0.82
1	Microprocessor Reset	$1.080	$1.08
3	Opto Isolator	$0.890	$2.67
1	DC/DC Converter	$8.350	$8.35
1	5V RS485 Dual Driver/Receiver	$2.150	$2.15
1	Single Port Xformer	$1.780	$1.78
1	PCB RJ-45 Shielded Jack	$0.930	$0.93
1	Tri-level LED	$1.130	$1.13
1	Tri-level LED	$1.130	$1.13
1	5 Position Terminal Plug	$2.694	$2.69
1	5 Position Terminal Plug	$0.819	$0.82
1	Connector 48Pin Eurocard	$1.000	$1.00
1	Misc Passives/PCB	$10.000	$10.00
		Twisted Only >	*$97.41*
		Fiber Only >	*$139.93*
		Both Total >	*$142.64*

Table 10 – ECC Estimated RAW Component Costs

3 Ethernet Communications

Ethernet communications will be utilized, wherever possible and feasible to do so, to allow for the "remote" control/maintenance of the ECC. The goal of this design is to make the ECC a passive/reactive device requiring minimal setup. The ECC will basically react to the "outside" world and do what it "thinks" is the best thing to do unless configured to do something different via setup. The Ethernet capabilities will be primarily used for ECC setup, diagnostics, firmware update, and access to attached slave devices by means of Hypertext Markup Language (HTML) and Hypertext Transfer Protocol (HTTP), File Transfer Protocol (FTP), Modbus over TCP/IP (ModbusTCP), and future plans for Manufacturing Message Specification over TCP/IP (MMSTCP).

3.1 HTTP Server and HTML Pages

A small subset of HTML v1.0 will be used with the HTTP server in the ECC primarily for ECC setup and diagnostics. With the onset and popularity of the World Wide Web and the Internet, the use of a browser is practically commonplace. This capability of the ECC allows for almost any user of an Internet browser to easily access and configure the ECC device. The recommended browser of choice should be Internet Explorer v5.0 or greater.

3.1.1 HTML Page Flow

The following figure is what the ECC's HTML page flow will potentially be like.

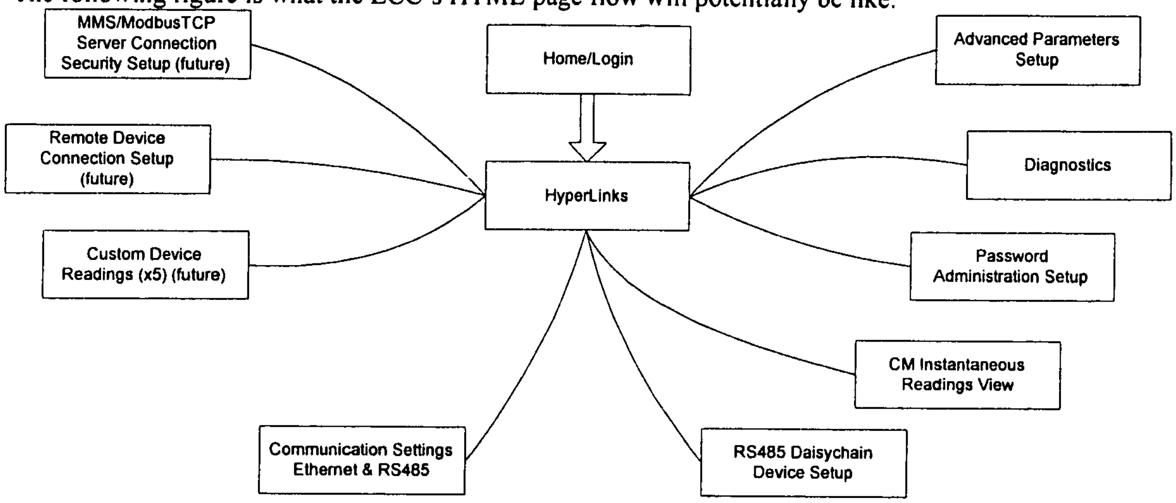


Figure 3 – HTML Page Flow Diagram

3.1.2 HTML Security

The ECC's HTML security will be designed in such a way to allow for four configurable account password access levels. These password access levels will be divided into three Password Accounts and one Administrator Account.

3.1.2.1 HTML Security Theory of Operation

When a user attempts to access the ECC for the first time during a web browser session, the ECC will force that user into the password logon page. Once there, the users will login to the ECC using one of the four defined passwords. During this login, the ECC will generate a random number and associate that password access level with it. The random number will then be the users "access token" and will automatically be appended to all the HTML page transactions during that session. This token will stay "alive" as long as the user keeps the session active by making requests to the ECC. Once this token is inactive for more than the default of ten minutes, the ECC will "expire" the token. The ECC will allow any combination, including redundant use, of all the passwords to allow up to ten access tokens to be active at any given time. This limits the number of active users viewing HTML pages to ten. The amount of time the ECC will wait during the inactivity period before "expiring" an access token will be configurable. For normal operations, it is recommended that the user return to the main links page and select to "log out" when fished interfacing with the ECC to immediately release that token slot for another user.

3.1.2.2 HTML Administrator Account

One of the four password accounts in the ECC will always be the Administrator password. This password account will always be granted full access to every HTML page available in the ECC and will also overlap to be the only password used for FTP operations. The only part of this account that is configurable is the password itself. The Administrator password will default to "admin". The Administrator password will be from one to eight characters and stored in four registers like the following table.

Register*	HiByte	LoByte
514	Admin password ASCII character 1	Admin password ASCII character 2
515	Admin password ASCII character 3	Admin password ASCII character 4
516	Admin password ASCII character 5	Admin password ASCII character 6
517	Admin password ASCII character 7	Admin password ASCII character 8

Table 11 – Administrator Password Setup Parameters

* Register numbers used in the tables throughout this document are CM registers.

3.1.2.3 HTML User Password Accounts

Three of the four password accounts in the ECC will be left to be used only for HTML access and will be called the User Password Accounts. Only the Administrator Account sets up these passwords. The parts of these accounts that are configurable are the passwords themselves and the level of access each password will allow to each HTML page in the ECC. These passwords will be configurable to allow no access, view-only access, or full access to each individual HTML page in the ECC. These four passwords can then be selectively given to and used by multiple users. The user passwords will default to "master", "engineer", and "operator" and all will have no access to any HTML page. The passwords will be from one to eight characters and stored in four registers each like the following tables.

Register	HiByte	LoByte
518	Pass1 password ASCII character 1	Pass1 password ASCII character 2
519	Pass1 password ASCII character 3	Pass1 password ASCII character 4
520	Pass1 password ASCII character 5	Pass1 password ASCII character 6
521	Pass1 password ASCII character 7	Pass1 password ASCII character 8

Table 12 – Pass1 Password Setup Parameters

Register	HiByte	LoByte
526	Pass2 password ASCII character 1	Pass2 password ASCII character 2
527	Pass2 password ASCII character 3	Pass2 password ASCII character 4
528	Pass2 password ASCII character 5	Pass2 password ASCII character 6
529	Pass2 password ASCII character 7	Pass2 password ASCII character 8

Table 13 – Pass2 Password Setup Parameters

Register	HiByte	LoByte
534	Pass3 password ASCII character 1	Pass3 password ASCII character 2
535	Pass3 password ASCII character 3	Pass3 password ASCII character 4
536	Pass3 password ASCII character 5	Pass3 password ASCII character 6
537	Pass3 password ASCII character 7	Pass3 password ASCII character 8

Table 14 – Pass3 Password Setup Parameters

The access level each password will have to each HTML page will be held in four registers, totaling twelve. This means that each password will have four registers associated with it according to the following table.

Register	HiByte	LoByte
522	Pass1 Password HTML Page Access Bitmap (Most Significant Word)	
523	Pass1 Password HTML Page Access Bitmap (2nd Most Significant Word)	
524	Pass1 Password HTML Page Access Bitmap (2nd Least Significant Word)	
525	Pass1 Password HTML Page Access Bitmap (Least Significant Word)	
530	Pass2 Password HTML Page Access Bitmap (Most Significant Word)	
531	Pass2 Password HTML Page Access Bitmap (2nd Most Significant Word)	
532	Pass2 Password HTML Page Access Bitmap (2nd Least Significant Word)	
533	Pass2 Password HTML Page Access Bitmap (Least Significant Word)	
538	Pass3 Password HTML Page Access Bitmap (Most Significant Word)	
539	Pass3 Password HTML Page Access Bitmap (2nd Most Significant Word)	
540	Pass3 Password HTML Page Access Bitmap (2nd Least Significant Word)	
541	Pass3 Password HTML Page Access Bitmap (Least Significant Word)	

Table 15 – Passwords Access Setup Parameters

Within these registers, the bits are utilized to represent the access ability of each password to each HTML page. Each HTML page will be represented by two bits. This means that there can be up to thirty-two pages secured by one of four access levels. The following table shows the value representation of the access levels.

Bit Values	Access Level
0x00	No access
0x01	Reserved
0x02	View only access
0x03	Full access

Table 16 – Password Access Values

The following table shows the representation of the access levels that the passwords have to each HTML page.

Register	Bits	HTML page
522	15 and 14	Pass1 access to Home Page
522	13 and 12	Pass1 access to CM Instantaneous Readings View
522	11 and 10	Pass1 access to Custom Device Page 1 View (Future)
522	9 and 8	Pass1 access to Custom Device Page 2 View (Future)
522	7 and 6	Pass1 access to Custom Device Page 3 View (Future)
522	5 and 4	Pass1 access to Custom Device Page 4 View (Future)
522	3 and 2	Pass1 access to Custom Device Page 5 View (Future)
522	1 and 0	Pass1 access to Communication Settings Setup
523	15 and 14	Pass1 access to RS485 Daisy chain Device Setup
523	13 and 12	Pass1 access to Diagnostics
523	11 and 10	Pass1 access to MMS/ModbusTCP Server Security Setup (Future)
523	9 and 8	Pass1 access to Remote Device Connection Setup (Future)
523	7 and 6	Reserved
523	5 and 4	Reserved
523	3 and 2	Reserved
523	1 and 0	Reserved
524	15 and 14	Reserved
524	13 and 12	Reserved
524	11 and 10	Reserved
524	9 and 8	Reserved
524	7 and 6	Reserved
524	5 and 4	Reserved
524	3 and 2	Reserved
524	1 and 0	Reserved
525	15 and 14	Reserved
525	13 and 12	Reserved
525	11 and 10	Reserved
525	9 and 8	Reserved
525	7 and 6	Reserved
525	5 and 4	Reserved
525	3 and 2	Reserved
525	1 and 0	Reserved
530, 531, 532, 533, 538, 539, 540, 541		This format is duplicated for registers 530, 531, 532, 533 (Pass2 access) and 538, 539, 540, 541 (Pass3 access)

Table 17 – Password HTML Access Bitmaps

The following figure is what the Password Administration Setup HTML page will potentially look like. This page will be accessible by the administrator password only.

Password Administration

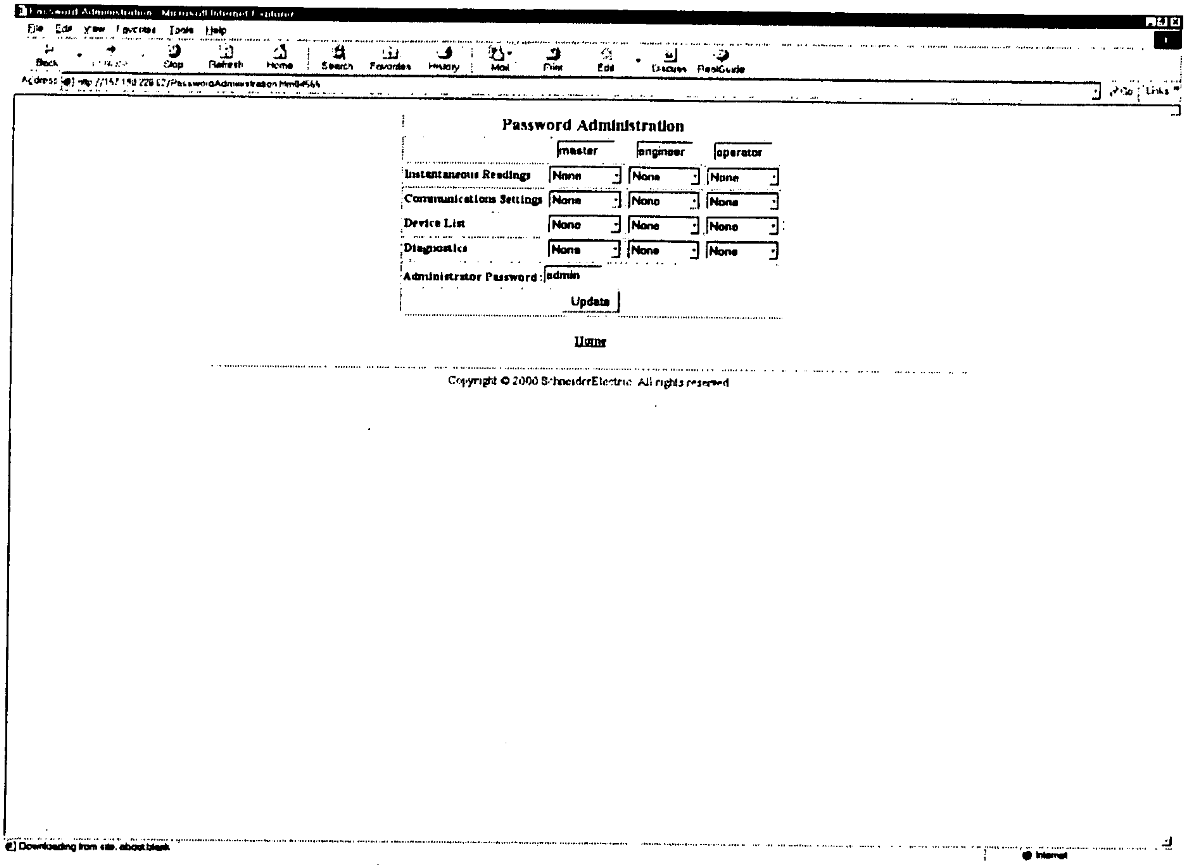


Figure 4 – Password Administration View

3.1.3 ECC Setup via HTML

All the setup information will be stored in the CM that the ECC is inserted into. This will allow for the ECCs to be "swappable". The ECC setup will primarily be done with HTML pages, but the CM display will have to be used during the initial steps.

3.1.3.1 Initial Setup

After the physical installation, the first step to completing the ECC setup will be via the CM display. The CM display will be used to setup the initial TCP/IP address, TCP/IP subnet mask, the TCP/IP router, and the Ethernet physical connection to use (fiber or twisted pair). With these parameters in place, the ECC will be accessible via the Ethernet, and the rest of the ECC setup can be done via HTML and a standard web browser or by FTP (basic setup only - Future).

3.1.3.2 HTML Ethernet – TCP/IP Setup

After the one-time initial step of getting the TCP/IP address assigned to the ECC through the CM display, the ECC can, from that point on, have its TCP/IP setup changed with HTML pages and a standard web browser. The following is the information used for the TCP/IP setup.

Register	HiByte	LoByte
500	IP Address 1st Octet (0 – 255)	IP Address 2nd Octet (0 – 255)
501	IP Address 3rd Octet (0 – 255)	IP Address 4th Octet (0 – 255)
502	IP Sub-net Mask 1st Octet (0 – 255)	IP Sub-net Mask 2nd Octet (0 – 255)
503	IP Sub-net Mask 3rd Octet (0 – 255)	IP Sub-net Mask 4th Octet (0 – 255)
504	IP Router Address 1st Octet (0 – 255)	IP Router Address 2nd Octet (0 – 255)
505	IP Router Address 3rd Octet (0 – 255)	IP Router Address 4th Octet (0 – 255)
506	Ethernet physical connection (0 = UTP, 1 = Fiber)	

Table 18 – TCP/IP Setup Parameters

The following figure is what the Ethernet TCP/IP Setup HTML page will potentially look like. The "Update" button will not be seen if the user has "view only" access.

Communications Settings

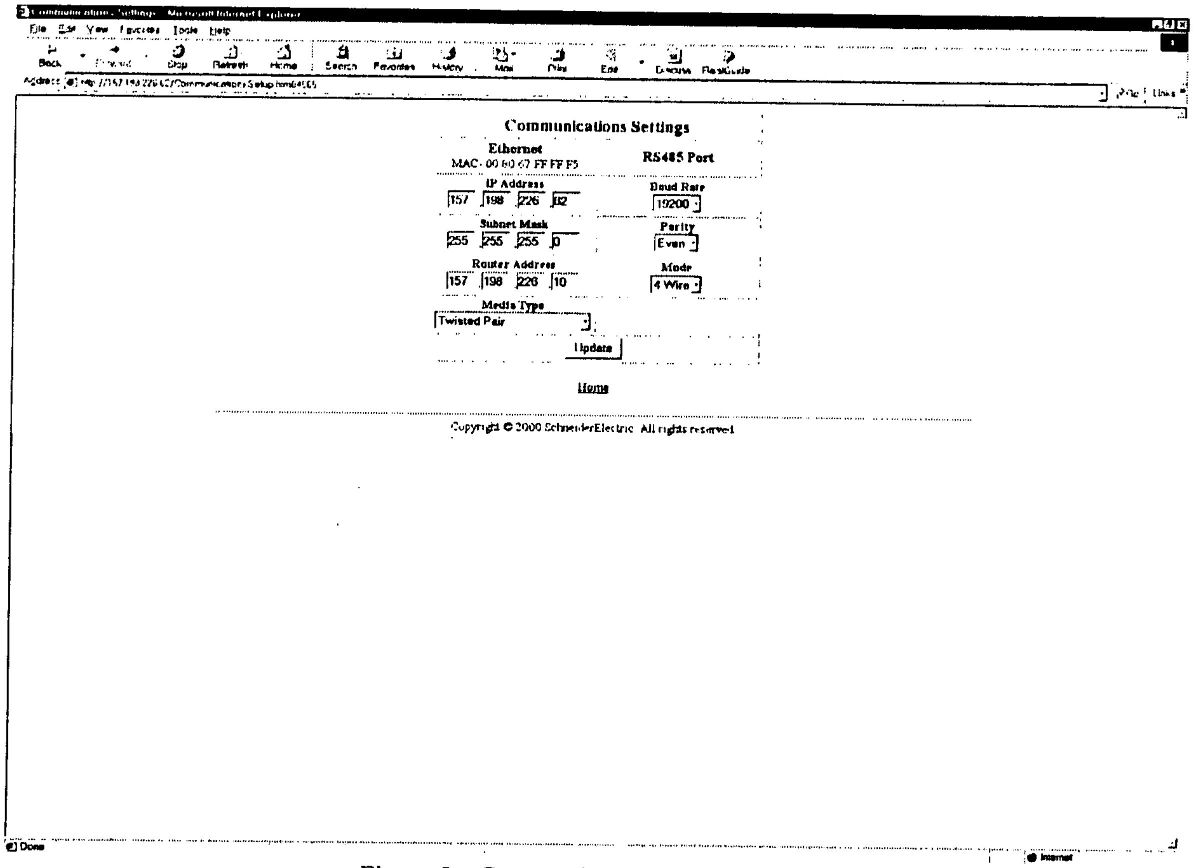


Figure 5 – Communications Settings View

3.1.3.3 HTML RS485 Device Definition Setup

Keeping in mind that we want the user to have to do as little setup as possible, all the devices on the daisy chain normally do not have to be defined. The ECC will be designed to function primarily as a passive Gateway. This means that the ECC will be able to pass through all Ethernet messages to the RS485 daisy chain based on the Ethernet protocol/format that the message was made. There are, however, scenarios in which this technique will not work, and the RS485 device must be defined so the ECC will be able to translate from one protocol to another. The devices that have to be selectively defined are PowerLogic protocol devices. PowerLogic protocol devices only have to be defined when a user wishes to communicate to them with the Ethernet protocol ModbusTCP. There will be a default list of 16 available device identification slots in the setup page interface for device definitions that will consist of an RS485 address and a protocol associated with it. The first entry will always show the slave address of the CM the ECC is inserted into. The following table shows the information used for defining a device.

Register	HiByte	LoByte
542	RS485 Device Definitions - Protocol (3 = PowerLogic, 8 = Modbus)	RS485 Device Definitions - Address (0 – 254)
543 – 604	62 more registers for up to 62 more Device definitions	
605	Number of viewable defined devices, includes CM that the ECC is attached to (1 – 62)	

Table 19 – RS485 Device Setup Parameters

One thing to note, the ECC will use the LoByte of these registers to build the route of 30,130,x to communicate to daisy-chained PowerLogic slave devices. Otherwise it will be used as the daisy-chained Modbus/Jbus slave ID.

The following figure is what the RS485 Device Setup HTML page will potentially look like. The "Update" button will not be seen if the user has "view only" access.

RS485 Device List Setup

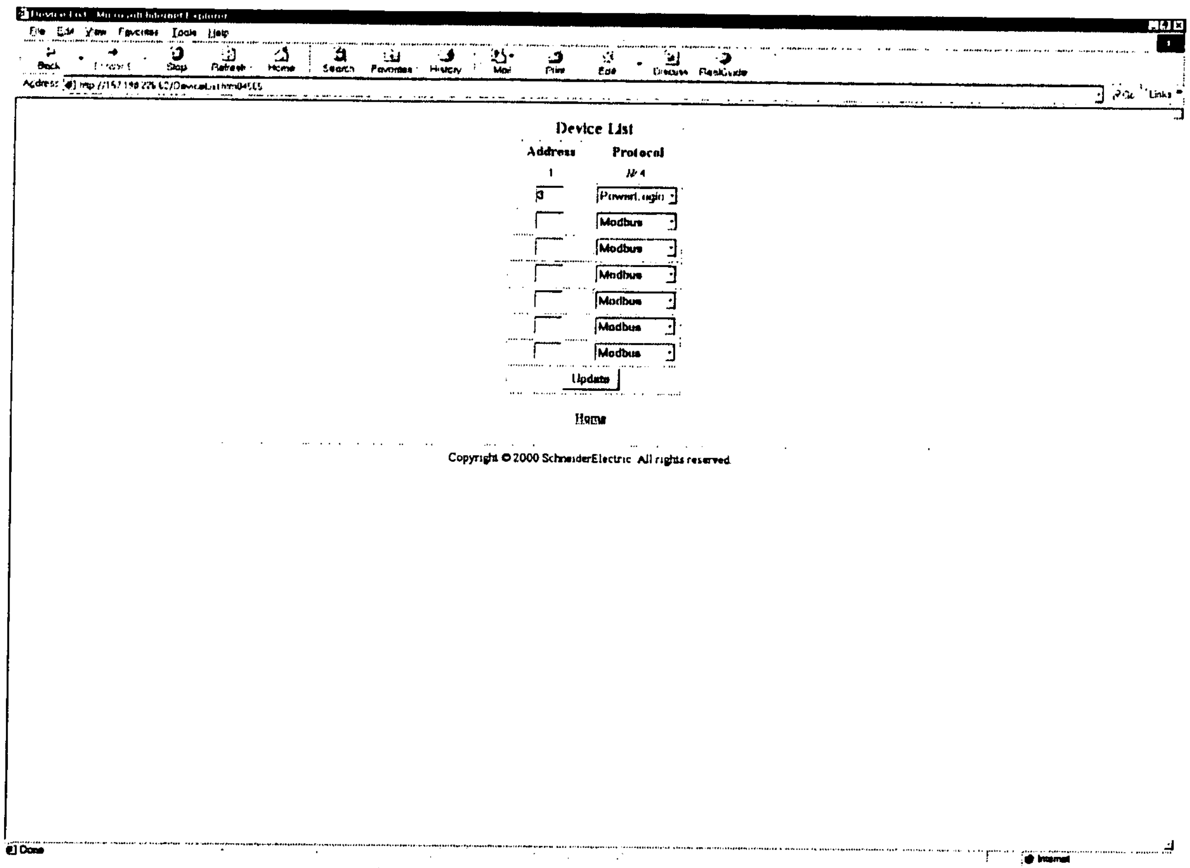


Figure 6 – RS485 Device List Setup View

3.1.3.4 HTML RS485 Setup

The RS485 Setup information will consist of baud rate, parity, and port mode. The following table shows the storage format of this setup information.

Register	HiByte	LoByte
512	RS485 Baud Rate (1200, 2400, 4800, 9600, 19200, 38400)	
513	RS485 Parity (0 = none, 2 = even)	RS485 Mode (0 = 4-wire Smart, 1 = 2-wire Smart)

Table 20 – RS485 Setup Parameters

The following figure is what the RS485 Serial Port Setup HTML page will potentially look like. The "Update" button will not be seen if the user has "view only" access.

Communications Settings

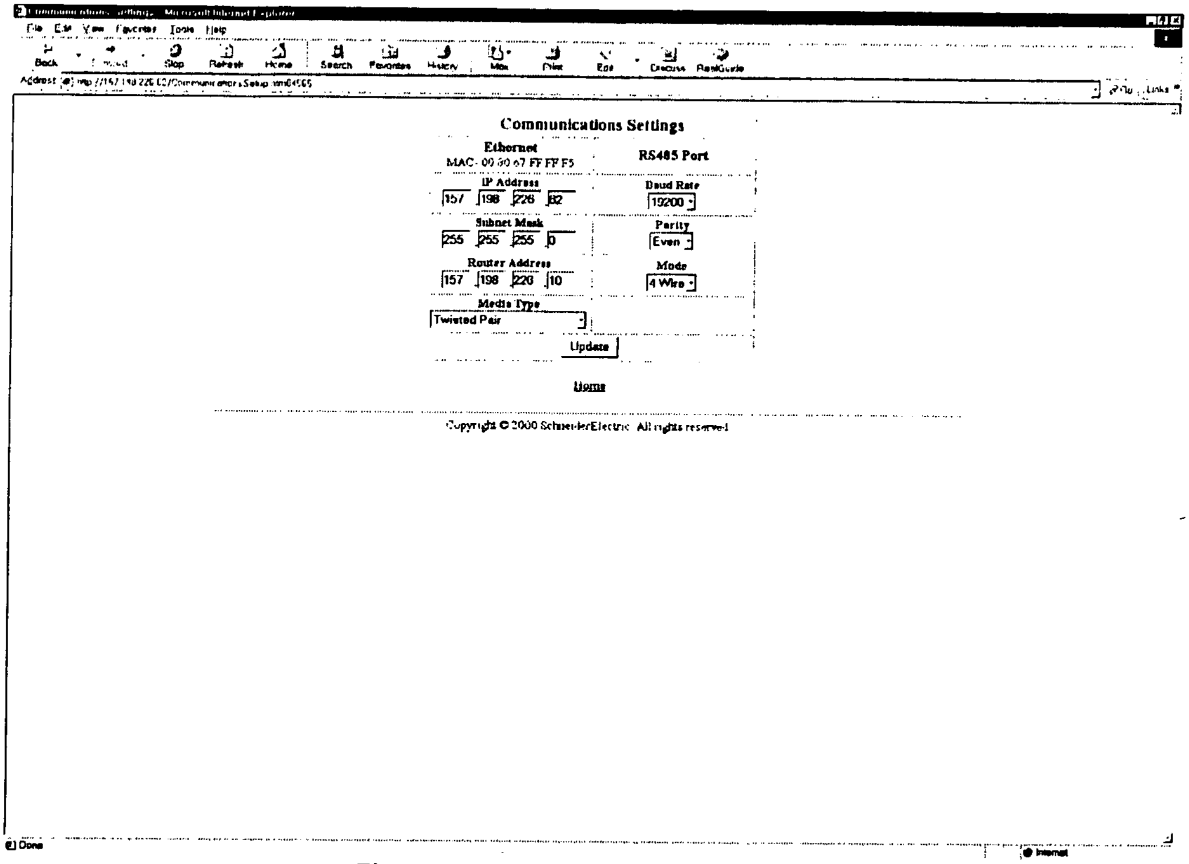


Figure 7 – Communications Settings View

3.1.3.5 HTML Remote Device Connection Setup (Future)

For sub-net initiated communications (the scenario where a serial master utilizes the ECC's RS485 port to gain access to remote locations/devices on the Ethernet, or the CM utilizes the ECC to gain access to remote locations/devices on the Ethernet), there has to be a way to define the remote nodes' locations. The ECC will have the ability to define up to ten remote Ethernet node locations. Also, the ECC will have the ability to define and associate up to eighty devices with these remote nodes. The following table is the format for the storage of the remote node/device information.

Registers	HiByte		LoByte
606	Associated Remote Node ID (0 – 9)	Remote Node Connection Type (1 = MMS SyMax format Port 1 2 = MMS SyMax format Port 2 3 = MMS Modbus format Port 1 4 = MMS Modbus format Port 2 5 = ModbusTCP)	Device Address 100's ID to be used in the Ethernet transaction (0 –247)
607 – 685	79 more registers for remote devices address 101 through 179		
686	Remote Node ID 0 IP Address 1st Octet (0 – 255)		Remote Node ID 0 IP Address 2nd Octet (0 – 255)
687	Remote Node ID 0 IP Address 3rd Octet (0 – 255)		Remote Node ID 0 IP Address 4th Octet (0 – 255)
688 – 705	18 more registers worth for remote node IDs 1 through 9		

Table 21 – Remote Device Connection Setup Parameters

The device initiating the communications will have to address to the ECC using addresses 100 through 179. These addresses will then serve as an identifier to "lookup" the information in that identifier's location. For Modbus initiators, the ECC will use the slave ID. For SyMax initiators, the ECC will use the last drop in the route. The information found in the location will then be used to make the Ethernet transaction. The following table shows the values for the connection types.

Remote Node Connection Type	Description
1	MMS SyMax format Port 1
2	MMS SyMax format Port 2
3	MMS Modbus format Port 1
4	MMS Modbus format Port 2
5	ModbusTCP

Table 22 – Remote Node Connection Types

The following figure is what the Remote Device Connections Setup HTML page will potentially look like. The Add/Change and Delete sections of the page will not be seen if the user has "view only" access.

Remote Device Connections Setup

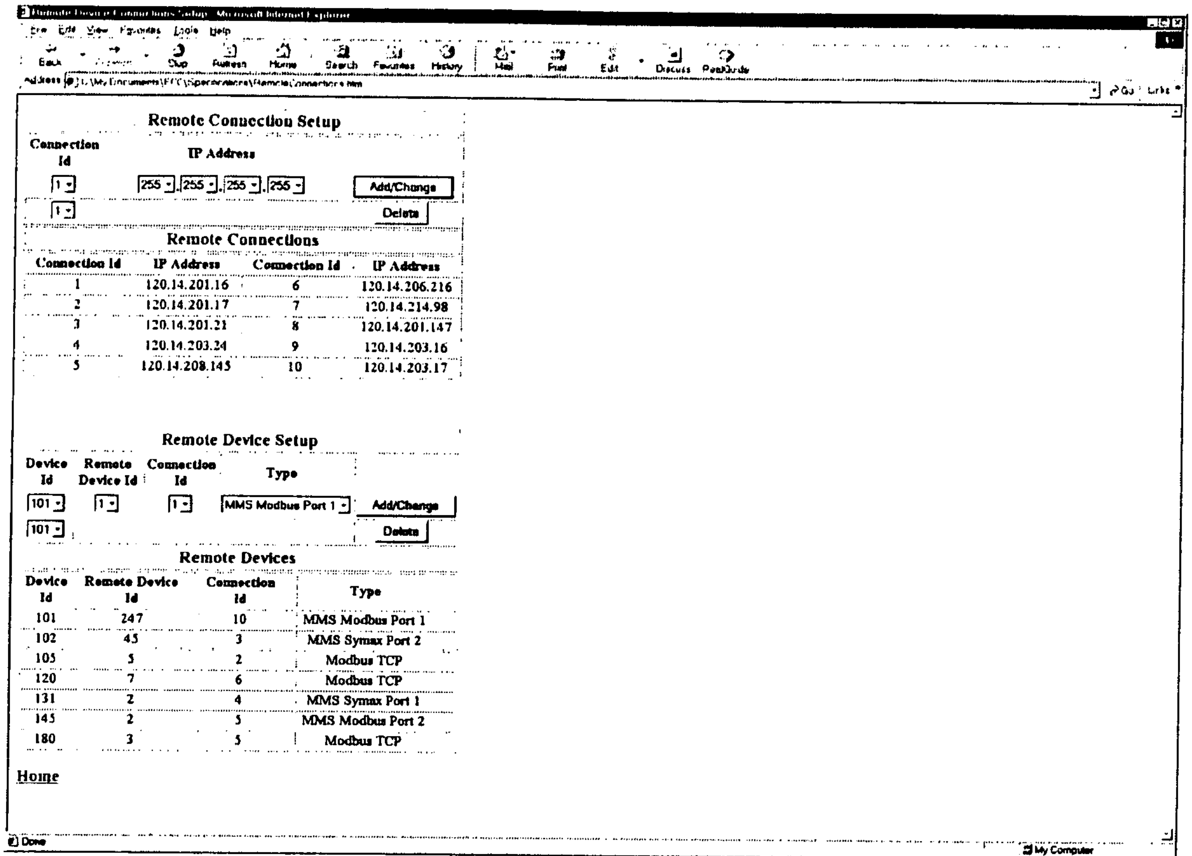


Figure 8 – Remote Device Connections Setup View

3.1.3.6 HTML MMS/ModbusTCP Server Security Setup (Future)

The ECC can allow for the MMS/ModbusTCP server connections to have definable client access. This means that the IP addresses of the MMS/ModbusTCP clients will have to be defined in the ECC before the ECC will allow access for communications. This feature can be "turned on" in one of two ways. The first way is to turn it on so that all clients attempting to connect have read only access except for the defined clients that will have full access. The other way is to turn it on so all clients attempting to connect have no access except for the defined clients that will have a definable read only or full access. The ECC will have the ability to define ten clients.

Note: this mechanism works well until multiple clients access the ECC by way of a TCP/IP proxy server. In this scenario, all the clients would be connecting to the ECC with the same IP address (the one of the proxy server). Thus, the ECC would be checking access levels for multiple clients based on a single TCP/IP address.

The following table shows the format for the information for the client security access.

Register	HiByte	LoByte
706	Client IP Address 0 – 1st Octet (0 – 255)	Client IP Address 0 – 2nd Octet (0 – 255)
707	Client IP Address 0 – 3rd Octet (0 – 255)	Client IP Address 0 – 4th Octet (0 – 255)
708 - 725	18 more registers for client IP addresses 1 through 9	
726	Bits 15 and 14 signify how the security is turned on or if it is turned off. (00 = Security off 01 = Security on, all undefined clients have read only access and defined clients have automatic full access 10 = Security on, all undefined clients have no access and defined clients must have access level defined)	Bit 0 represents client 0, bit 1 represents client 1, through bit 9. (0 = Full Access, 1 = Read Only Access, these bits are ignored if bits 15 and 14 = 10)

Table 23 – MMS/Modbus TCP Security Setup Parameters

The following figure is what the MMS/ModbusTCP Security Setup HTML page will potentially look like. The "Update Settings" button will not be seen if the user has "view only" access.

MMS/MBTCP Security Setup

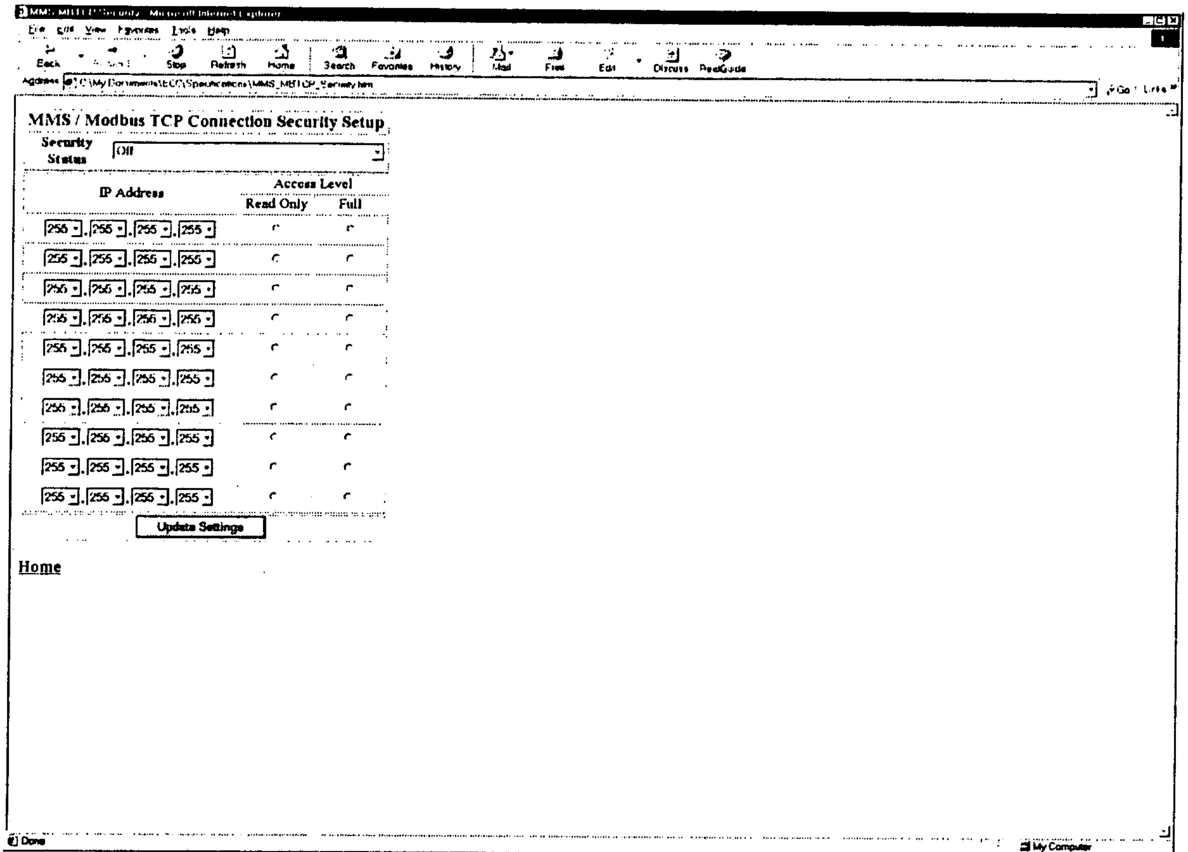


Figure 9 – MMS/ModbusTCP Security Setup View

3.1.3.7 HTML ECC Advanced Parameters Setup

The ECC will have an advanced parameters setup page that will be accessible by the administrator password only. This setup page will allow for advanced users to "tweak" ECC timing values that normally should never be changed. The administrator will also be able to change the default language the ECC will use at the login page. The following table shows the storage format for these values.

Register	HiByte	LoByte
507	ModbusTCP Client Timeout in seconds (5 – 60)	MMSTCP Client Timeout in seconds (5 – 60)
508	HTML Access token expiration time in minutes (1 – 255)	
509	RS485 Timeout in seconds (3 – 10)	DPR Timeout in seconds (3 – 10)
510	CM/RS485 Time Synchronization Interval in seconds (0 = disabled, 30 – 65535)	
511	HTML default language type (0 = English, 1 = French, 2 = Spanish)	

Table 24 – Advanced Setup Parameters

The following figure is what the MMS/ModbusTCP Security Setup HTML page will potentially look like. This page will be accessible by the administrator password only.

Advanced Setup

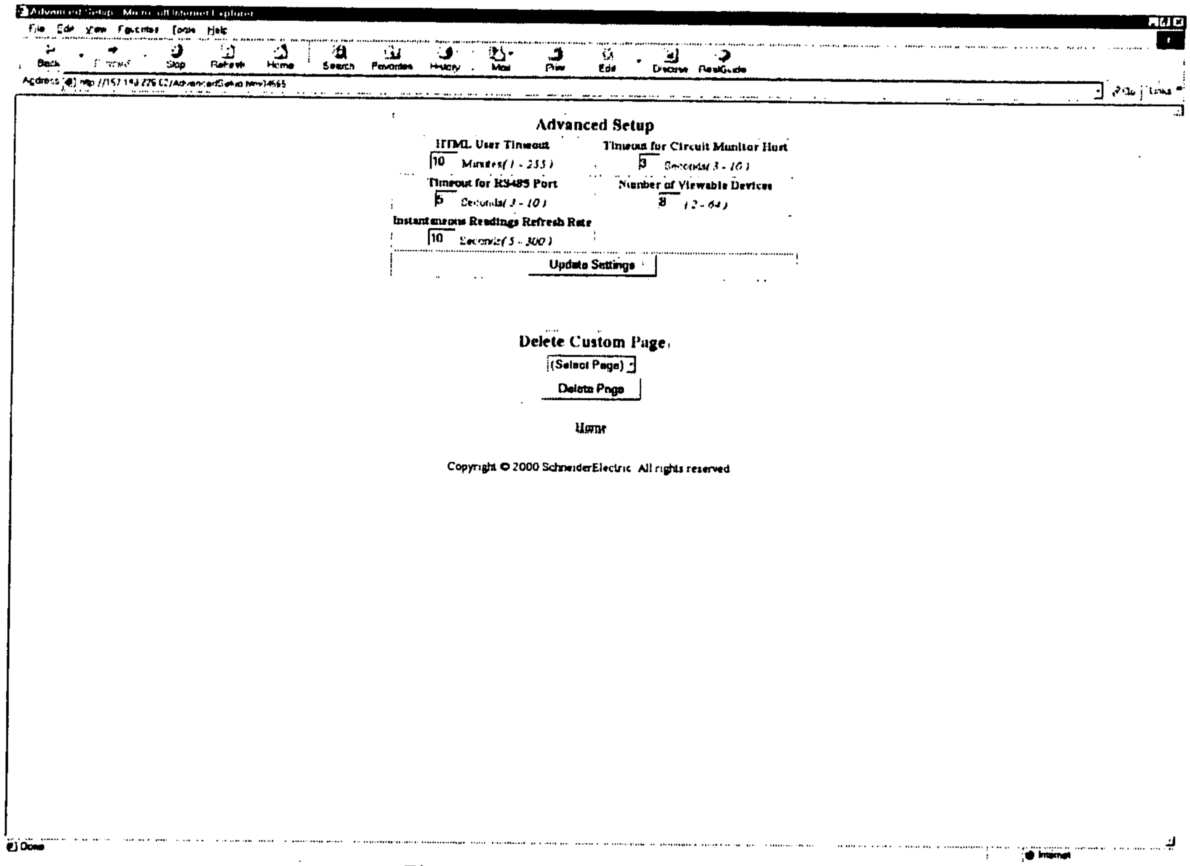


Figure 10 – Advanced Setup View

3.1.4 HTML Diagnostics View

The ECC will have the ability to accumulate diagnostics information for display to the user for troubleshooting or performance knowledge. Also, the ECC version information will be shown here. The counters and watermarks will be volatile and are shown in the following table.

Counters/Watermarks
RS485 Timeouts
RS485 Checksum Errors
RS485 Protocol Errors
RS485 Outbound Read Messages
RS485 Inbound Read Messages
RS485 Outbound Write Messages
RS485 Inbound Write Messages
Dual Port Ram Timeouts
Dual Port Ram Checksum Errors
Dual Port Ram Protocol Errors
Dual Port Ram Outbound Read Messages
Dual Port Ram Inbound Read Messages
Dual Port Ram Outbound Write Messages
Dual Port Ram Inbound Write Messages
MMS Timeouts (Future)
MMS Protocol Errors (Future)
MMS Outbound Read Messages (Future)
MMS Inbound Read Messages (Future)
MMS Outbound Write Messages (Future)
MMS Inbound Write Messages (Future)
MMS Inbound Connections (Future)
MMS Outbound Connections (Future)
MMS Active Inbound Connections (Future)
MMS Active Outbound Connections (Future)
MMS Maximum Inbound Connections (Future)
MMS Maximum Outbound Connections (Future)
ModbusTCP Timeouts
ModbusTCP Protocol Errors
ModbusTCP Outbound Read Messages
ModbusTCP Inbound Read Messages
ModbusTCP Outbound Write Messages
ModbusTCP Inbound Write Messages
ModbusTCP Inbound Connections
ModbusTCP Outbound Connections
ModbusTCP Active Inbound Connections
ModbusTCP Active Outbound Connections
ModbusTCP Maximum Inbound Connections
ModbusTCP Maximum Outbound Connections
Ethernet CRC Errors
Ethernet Alignment Errors
Ethernet Code Errors
Ethernet Long Frame Errors
Ethernet Short/Runt Frame Errors
Ethernet Maximum Collision

Table 25 – ECC Diagnostic Counters/Watermarks

The following figure is what the HTML Diagnostics View page will potentially look like. The "Reset" button will not be seen if the user has "view only" access.

Diagnostics View

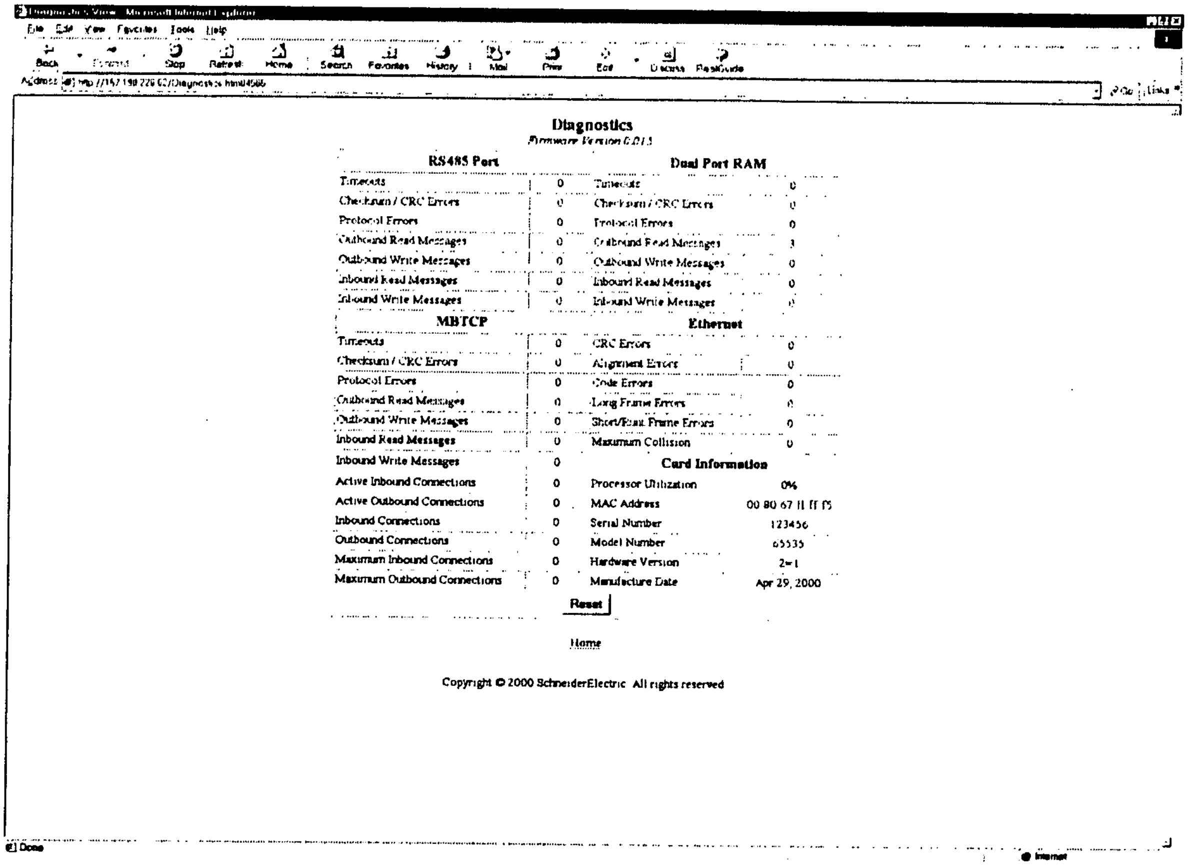


Figure 11 – Diagnostics View

3.1.5 Multilingual HTML (Future)

To be able to have the ECC available outside the United States and even more acceptable within, it will need to have all displays available in English, French, and Spanish. The user may choose a language for the browser session at login. The default language selection at login will be English, but the default language may be changed by entering the Advanced Setup HTML page with the administrator password. This means that all parts of the ECC firmware that has viewable strings will have to be designed in such a fashion to be displayed in multiple languages. The following table shows the storage of the HTML language type.

Register	HiByte	LoByte
511	HTML default language type (0 = English, 1 = French, 2 = Spanish)	

Table 26 – HTML Default Language

The following figure is what the Login HTML page will potentially look like pertaining to being Multilingual.

Log In

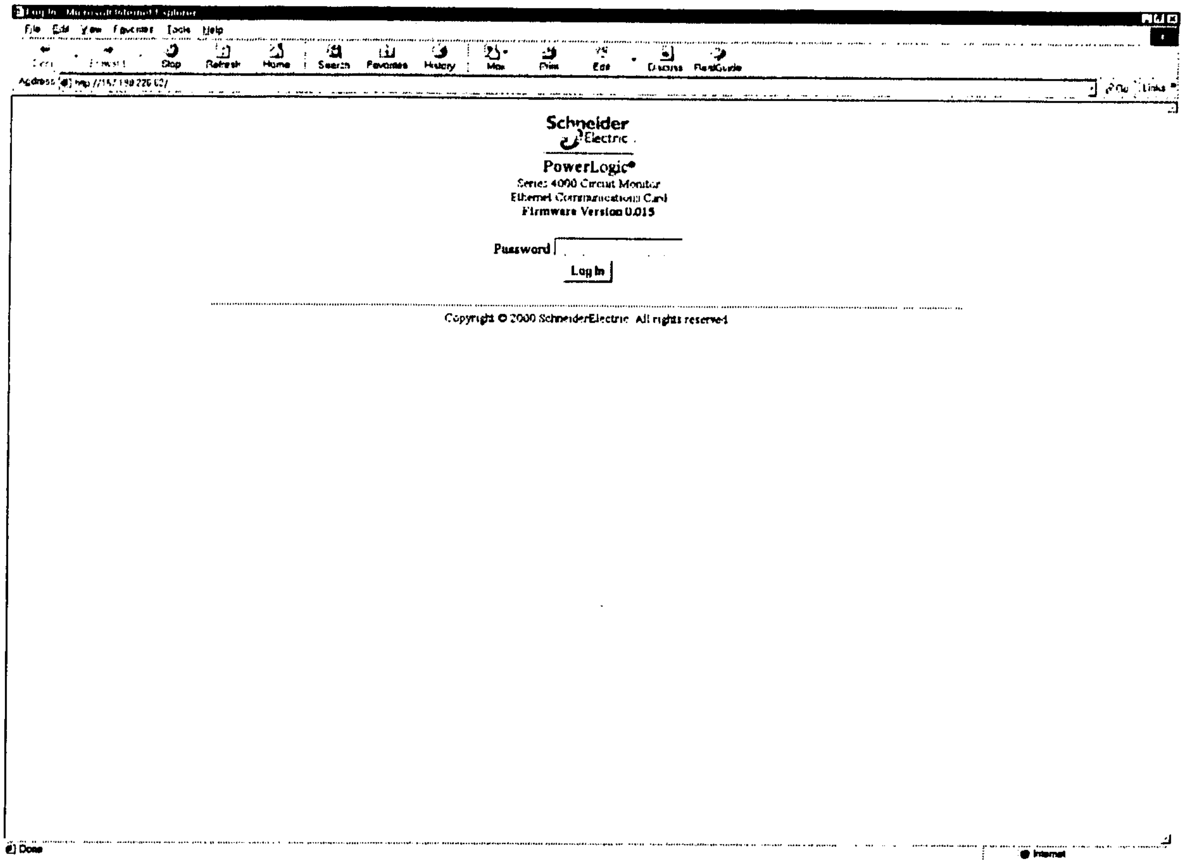


Figure 12 – Login View

3.1.6 HTML Home Page

The user will be transferred to the ECC home page after the login. Only the links that the user has access to will appear in the list. The following figure is what the ECC home page will potentially look like.

Home Page

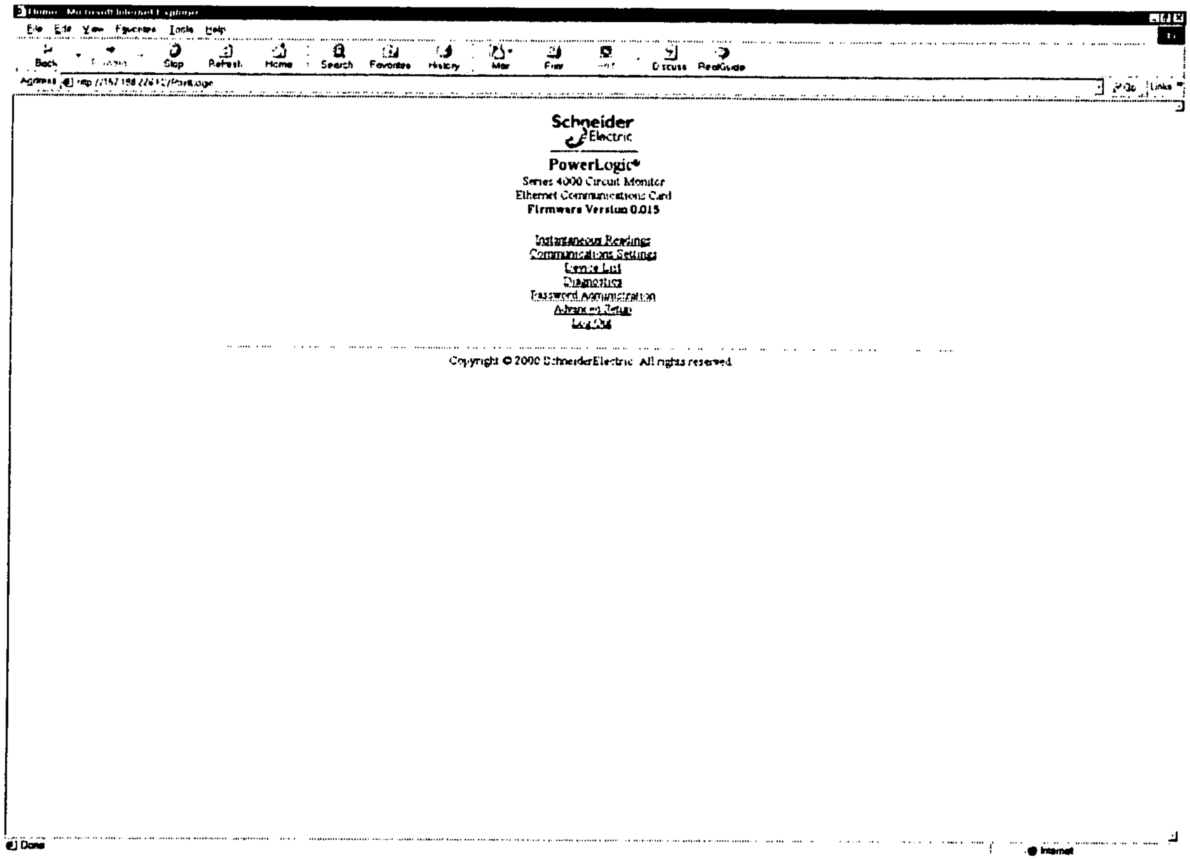


Figure 13 – ECC Main Links View

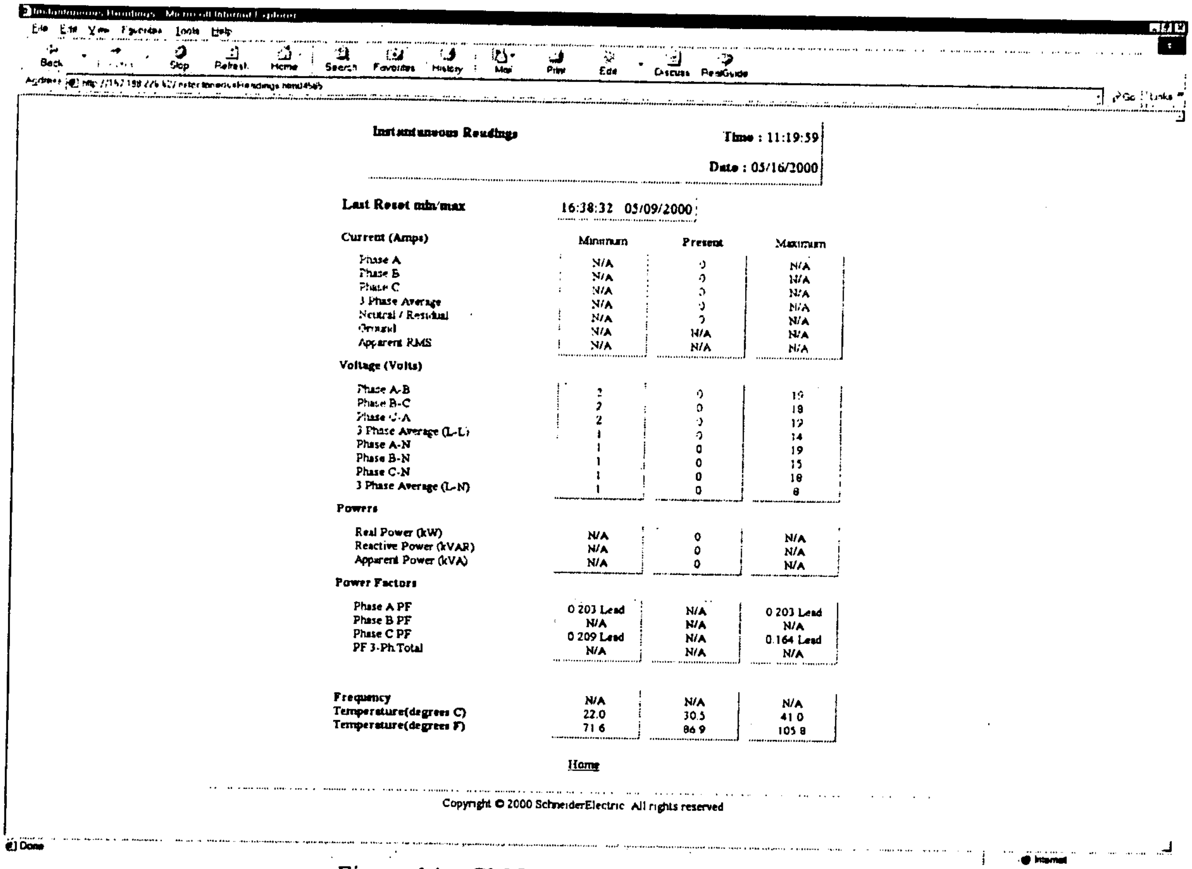
3.1.7 HTML Real Time Data Device Tables

The ECC will have the capability to show limited, real time, tabular data from the attached devices to the users in the form of HTML pages. These pages will consist of one static page for viewing information from the CM the ECC is inserted into and the possibility for up to five custom/downloadable HTML pages for viewing devices on the local RS485 daisy chain. These pages will be stored in the CM that the ECC is inserted into and must not exceed 20 kilobytes in size each.

3.1.7.1 HTML CM Instantaneous Readings View

The following shows the possible look of the CM device HTML real-time data table. This page will be configurable by the administrator password for view only or no access.

CM Instantaneous Readings View



Instantaneous Readings

Time : 11:19:59

Date : 05/16/2000

Last Reset min/max 16:38:32 05/09/2000

	Minimum	Present	Maximum
Current (Amps)			
Phase A	N/A	0	N/A
Phase B	N/A	0	N/A
Phase C	N/A	0	N/A
3 Phase Average	N/A	0	N/A
Neutral / Residual	N/A	0	N/A
Ground	N/A	N/A	N/A
Apparent RMS	N/A	N/A	N/A
Voltage (Volts)			
Phase A-B	2	0	19
Phase B-C	2	0	18
Phase C-A	2	0	17
3 Phase Average (L-L)	1	0	14
Phase A-N	1	0	19
Phase B-N	1	0	15
Phase C-N	1	0	18
3 Phase Average (L-N)	1	0	8
Powers			
Real Power (kW)	N/A	0	N/A
Reactive Power (kVAR)	N/A	0	N/A
Apparent Power (kVA)	N/A	0	N/A
Power Factors			
Phase A PF	0 203 Lead	N/A	0 203 Lead
Phase B PF	N/A	N/A	N/A
Phase C PF	0 209 Lead	N/A	0.164 Lead
PF 3-Ph Total	N/A	N/A	N/A
Frequency	N/A	N/A	N/A
Temperature(degrees C)	22.0	30.5	41 0
Temperature(degrees F)	71 6	86 9	105 8

Home

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Figure 14 – CM Instantaneous Readings View

3.1.7.2 HTML Custom Device Readings Tables (Future)

The custom device tables will be available for use preferably by our Engineering Services group or by users very knowledgeable in the realm of HTML and JavaScript. The pages will be written in HTML with special delimiters that will tell the ECC to dynamically get register information from a device. Great care will have to be taken by the page author to try to get the optimal performance out of these pages and to keep the sizes within the allowed range. The delimiters at the beginning (PL__) and end (__PL) of a string signify to the ECC to parse this string and dynamically fill it with register data. The following is a table of the supported PowerLogic tags and also, an HTML example of how they could be used.

Function Code	Function Name	PowerLogic Tag
0	SyMax Block Read - Registers	<DeviceID>^<RegisterAddress>[<NumberOfRegisters>] example tag = PL__1^1003[5]__PL example of data returned = 85,86,84,25,56
4	SyMax Scattered Read – Registers	<DeviceID>^<RegisterAddress1>,<RegisterAddress2>,etc example tag = PL__1^1003,1004,1005,1006,1007 example of data returned = 85,86,84,25,56
3	Modbus Block Read – Holding Registers	<DeviceID>^H<RegisterAddress>[<NumberOfRegisters>] example tag = PL__1^H1003[5]__PL example of data returned = 85,86,84,25,56
4	Modbus Block Read – Input Registers	<DeviceID>^I<RegisterAddress>[<NumberOfRegisters>] example tag = PL__1^I1003[5]__PL example of data returned = 85,86,84,25,56
100	Modbus Scattered Read – Holding Registers	<DeviceID>^S<RegisterAddress1>,<RegisterAddress2>,etc example tag = PL__1^S1003,1004,1005,1006,1007__PL example of data returned = 85,86,84,25,56

Table 27 – PowerLogic HTML Tags

Source:

```
<html>

<head>
<META HTTP-EQUIV="refresh" CONTENT="5">
<title>CM2350 - Slave Device 3</title>
</head>

<body>
<form name="view_form">
    <p align="center">
      <input type = "text" name = "time_spot" size = "40">
      <table border="1" width="600">
       <tr>
           <td width="600"><p align="center"><font size="4"><b>CM2350 - Slave
             Device 3</b></font></p>
           </td>
       </tr>
    </table>
    <table border="1" width="600">
        <tr>
            <td width="300">
              <p align="center">Frequency</p>
            </td>
            <td align="center" width="90"><p align="center"><input
            type="text" size="5" name="frequency"></p>
            <td width="100">
              <p align="center">Hz</p>
            </td>
        </tr>
        <tr>
            <td width="300">
              <p align="center">Current Phase A</p>
            </td>
            <td align="center" width="90"><p align="center"><input
            type="text" size="5" name="currentphasea"></p>
            <td width="100">
              <p align="center">Amps</p>
            </td>
        </tr>
        <tr>
            <td width="300">
              <p align="center">Current Neutral</p>
            </td>
            <td align="center" width="90"><p align="center"><input
            type="text" size="5" name="currentneutral"></p>
            <td width="100">
              <p align="center">Amps</p>
            </td>
        </tr>
        <tr>
            <td width="300">
              <p align="center">Current Ground</p>
            </td>
            <td align="center" width="90"><p align="center"><input
            type="text" size="5" name="currentground"></p>
            <td width="100">
              <p align="center">Amps</p>
            </td>
        </tr>
    </table>
```

```
<br><HR SIZE="1" width="66%"><CENTER><font face="Times Roman"
size="2">Copyright © 2000 SchneiderElectric. All rights
reserved.</font></CENTER>
</form>

<script language="JavaScript">
function ShowFreq()
{
    Registers = [PL__3^2020,2021,2022,2025,1001,1003,1006,1007__PL];
    ScaleFactorA = Registers[0];
    ScaleFactorB = Registers[1];
    ScaleFactorC = Registers[2];
    ScaleFactorF = Registers[3];
    Frequency = Registers[4];
    CurrentPhaseA = Registers[5];
    CurrentNeutral = Registers[6];
    CurrentGround = Registers[7];
    ScaleFactorAMultiplier = 0;
    ScaleFactorBMultiplier = 0;
    ScaleFactorCMultiplier = 0;
    ScaleFactorFMultiplier = 0;
    TheTime = new Date();

    switch (ScaleFactorA)
    {
        case -2:
            ScaleFactorAMultiplier = 0.01;
            break;
        case -1:
            ScaleFactorAMultiplier = 0.1;
            break;
        case 1:
            ScaleFactorAMultiplier = 10;
            break;
        default:
            ScaleFactorAMultiplier = 1;
            break;
    }
    switch (ScaleFactorB)
    {
        case -2:
            ScaleFactorBMultiplier = 0.01;
            break;
        case -1:
            ScaleFactorBMultiplier = 0.1;
            break;
        case 1:
            ScaleFactorBMultiplier = 10;
            break;
        default:
            ScaleFactorBMultiplier = 1;
            break;
    }
    switch (ScaleFactorC)
    {
        case -2:
            ScaleFactorCMultiplier = 0.01;
            break;
        case -1:
            ScaleFactorCMultiplier = 0.1;
            break;
        case 1:
            ScaleFactorCMultiplier = 10;
```

```
            break;
        default:
            ScaleFactorCMultiplier = 1;
            break;
    }
    switch (ScaleFactorF)
    {
        case -1:
            ScaleFactorFMultiplier = 0.1;
            break;
        default:
            ScaleFactorFMultiplier = 0.01;
            break;
    }
    Frequency *= ScaleFactorFMultiplier;
    CurrentPhaseA *= ScaleFactorAMultiplier;
    if (CurrentNeutral == -32768)
        CurrentNeutral = "N/A";
    else
        CurrentNeutral *= ScaleFactorBMultiplier;
    if (CurrentGround == -32768)
        CurrentGround = "N/A";
    else
        CurrentGround *= ScaleFactorCMultiplier;
    document.view_form.frequency.value = Frequency;
    document.view_form.currentphasea.value = CurrentPhaseA;
    document.view_form.currentneutral.value = CurrentNeutral;
    document.view_form.currentground.value = CurrentGround;
    document.view_form.time_spot.value = TheTime;
}
ShowFreq();
</script>

</body>

</html>
```

View:

Proof

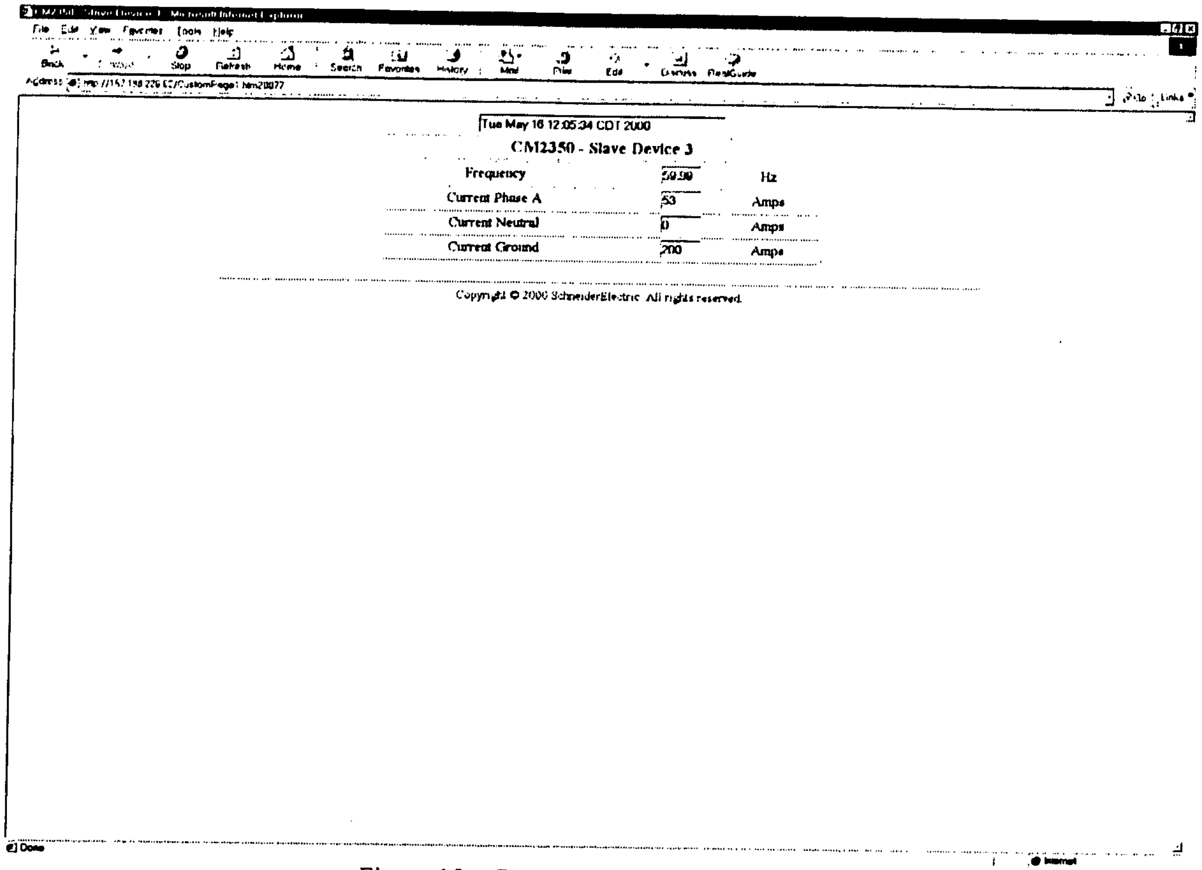

Figure 15 – Custom Device Example View

3.2 ModbusTCP Server

The ECC will be able to provide the ModbusTCP server functionality to allow external ModbusTCP clients access to the ECC's attached slave devices and the CM the ECC is inserted into. The ECC will post TCP/IP connection listens on TCP port 502. The ECC will allow a maximum of ten ModbusTCP clients to connect at any given time.

3.2.1 ModbusTCP Server Function Codes

The following table shows the supported ModbusTCP function codes the ECC will allow.

Function Code	Sub-function Code	Description	Availability
1	X	Block Read - Coil Status	Phase I
2	X	Block Read - Input Coil Status	Phase I
3	X	Block Read - Holding Registers	Phase I
4	X	Block Read - Input Registers	Phase I
5	X	Single Write - Coil	Phase I
6	X	Single Write - Holding Register	Phase I
16	X	Block Write - Holding Registers	Phase I
20	X	Block Read - General Reference/File	Phase I
21	X	Block Write - General Reference/File	Phase I
100	4	Scattered Read - Holding Registers	Phase I
101	50	Set Time	Future
102	X	Security Operations	Phase I

Table 28 – ModbusTCP Server Function Codes

3.3 MMSTCP Server (Future)

The ECC will be able to provide the MMSTCP (RFC-1006) server functionality to allow external PowerLogic compatible MMSTCP clients access to the ECC's attached slave devices. The ECC will allow a maximum of ten MMSTCP connections at any given time. The ECC will post MMSTCP connection listens on TCP port 102 with the MMS parameters in the following table.

MMS Parameter	Value
AP Title	0 0 00 0
AP Invoke ID	0
AE Qualifier	0
AE Invoke ID	0
Psel	00 00 00 02
Ssel	00 01
Tsel	00 01

Table 29 – MMSTCP Server Connect Parameters

3.3.1 MMSTCP Services (Future)

The following table shows the MMS services supported in the ECC and gives a slight definition of how each is used.

MMS Service	Description
Initiate	The ECC responds to all Initiate indications and is able to initiate connections for sub-net initiated communications.
Conclude	The ECC is able to respond to a Conclude indication and is able to conclude a connection in the case of inactivity on a channel or a request from sub-net initiated communications.
Abort	The ECC can respond to an Abort indication and generate a serial error code, if needed, in the case of sub-net initiated communications.
Cancel	The ECC responds to a Cancel by generating a serial error code, if needed, in the case of sub-net initiated communications.
Reject	The ECC can receive a Reject indication from another device and generate a serial error code, if needed, in the case of sub-net initiated communications.
Identify	The ECC returns the appropriate device information (vendor name, model, and firmware version) in response to an Identify indication.
Variable Read/Write	The ECC responds to data access requests for symbolically addressed variables. Additionally, the ECC accepts serial read/write requests from a sub-net initiating device, converts them to a MMS symbolic address request, and returns the data appropriately.

Table 30 – ECC Supported MMSTCP Services

3.3.2 MMSTCP Server Security Backwards Compatibility (Future)

Due to the new IP connection-based security implementation, the ECC will not need to support the old security scheme implemented in existing EGWs. This should not cause any problems in systems still needing security or even in existing systems where an ECC is installed with other EGWs. The new mechanism in the ECC can still be utilized in conjunction with the old mechanism in the EGWs with no problems.

3.3.3 MMSTCP Symbolic Variable Strings (Future)

Character-based symbolic addressing will be used for data access. The basic format will be a two-part address separated by a "^". The first part is the end Device ID; the second part is protocol-specific. The following table shows the representation of each of the MMSTCP symbolic variable representations of the sub-network requests.

SyMax Function Code	Name	SyMax Format for MMS
0	Block Read - Registers	<DeviceID>^<RegisterAddress>[<NumberOfRegisters>], *,
2	Block Write - Registers	<DeviceID>^<RegisterAddress>[<NumberOfRegisters>], *,
4	Scattered Read - Registers	<DeviceID>^<RegisterAddress>, <DeviceID>^<RegisterAddress>,
4	Record Read - File	<DeviceID>^<RegisterAddress>[<NumberOfRegisters>], <DeviceID>^RecordNumber[r]

Table 31 – MMSTCP SyMax Symbolic Variable Formats

Modbus /Jbus Function Code	Name	Modbus/Jbus Format for MMS
1	Block Read – Coil Status	<DeviceID>^C<CoilAddress>[<NumberOfCoils>], *,
2	Block Read – Input Coil Status	<DeviceID>^D<CoilAddress>[<NumberOfCoils>], *, *
3	Block Read – Holding Registers	<DeviceID>^H<RegisterAddress>[<NumberOfRegisters>], *, *
4	Block Read – Input Registers	<DeviceID>^I<RegisterAddress>[<NumberOfRegisters>] *,
5	Single Write – Coil	<DeviceID>^C<CoilAddress>
6	Single Write – Register	<DeviceID>^H<RegisterAddress>
16	Block Write – Holding Registers	<DeviceID>^H<RegisterAddress>[<NumberOfRegisters>], *, *
20	Block Read – General Reference/File	<DeviceID>^F<RegisterAddress>[<NumberOfRegisters>]<FileNumber>, *, *
21	Block Write - General Reference/File	<DeviceID>^F<RegisterAddress>[<NumberOfRegisters>]<FileNumber>, *, *
100	Scattered Read – Holding Registers	<DeviceID>^S<RegisterAddress>, <DeviceID>^S<RegisterAddress>, <DeviceID>^S<RegisterAddress>
102	Security Operations	<DeviceID>^Z<SecurityCode>^ regular formats minus device ID

Table 32 – MMSTCP Modbus/Jbus Symbolic Variable Formats

3.3.3.1 MMSTCP Symbolic Variable String Examples (Future)

A SyMax Block Read of registers 1002 through 1004 from a SyMax device defined as Device ID 12 in the ECC should be done with a single MMS read of a list of 3 individual symbolic variables in the following format:

12^1002[3]	= Variable 1
*	= Variable 2
*	= Variable 3

A SyMax Block Write of registers 6800 through 6802 from a SyMax device defined as Device ID 12 in the ECC should be done with a single MMS write of a list of 4 individual symbolic variables in the following format:

12^6800[3]	= Variable 1	-32768 to 32767 for data
*	= Variable 2	-32768 to 32767 for data
*	= Variable 3	-32768 to 32767 for data
*	= Variable 4 with mask value to be applied to the written registers' data	

Note that there is (1 + NumberOfRegisters) variables. This is because the last variable's data must be used as a mask value in the SyMax operation. This last variable's data is usually FFFF because all the bits for

all the values are to be written into the associated registers. The FFFF value can be changed if only certain bits are to be written.

A SyMax Scattered Read of registers 1002, 1004, 1008 from a SyMax device defined as Device ID 12 in the ECC should be done with a single MMS read of a list of 3 individual symbolic variables in the following format:

12^1002	= Variable 1
12^1004	= Variable 2
12^1008	= Variable 3

A Modbus/Jbus Block Read of coils 20 through 22 from a Modbus/Jbus device defined as Device ID 12 in the ECC should be done with a single MMS read of a list of 3 individual symbolic variables in the following format:

12^C20[3]	= Variable 1
*	= Variable 2
*	= Variable 3

A Modbus Block Read of Input coils 100020 through 100022 from a Modbus device defined as Device ID 12 in the ECC should be done with a single MMS read of a list of 3 individual symbolic variables in the following format:

12^D20[3]	= Variable 1
*	= Variable 2
*	= Variable 3

A Jbus Block Read of Input coils 20 through 22 from a Jbus device defined as Device ID 12 in the ECC should be done with a single MMS read of a list of 3 individual symbolic variables in the following format:

12^D20[3]	= Variable 1
*	= Variable 2
*	= Variable 3

A Modbus Block Read of Holding registers 401002 through 401004 from a Modbus device defined as Device ID 12 in the ECC should be done with a single MMS read of a list of 3 individual symbolic variables in the following format:

12^H1002[3]	= Variable 1
*	= Variable 2
*	= Variable 3

A Jbus Block Read of Holding registers 1002 through 1004 from a Jbus device defined as Device ID 12 in the ECC should be done with a single MMS read of a list of 3 individual symbolic variables in the following format:

12^H1002[3]	= Variable 1
*	= Variable 2
*	= Variable 3

A Modbus Block Read of Input registers 301002 through 301004 from a Modbus device defined as Device ID 12 in the ECC should be done with a single MMS read of a list of 3 individual symbolic variables in the following format:

12^I1002[3]	= Variable 1
*	= Variable 2
*	= Variable 3

A Jbus Block Read of Input registers 1002 through 1004 from a Jbus device defined as Device ID 12 in the ECC should be done with a single MMS read of a list of 3 individual symbolic variables in the following format:

12^I1002[3]	= Variable 1
*	= Variable 2

*	= Variable 3	

A Modbus/Jbus Single Coil Write to coil 20 to a Modbus/Jbus device defined as Device ID 12 in the ECC should be done with a single MMS write of a single symbolic variable in the following format:

12^C20	= Variable 1	1 or 0 for data

A Modbus Single Register Write to register 406800 to a Modbus device defined as Device ID 12 in the ECC should be done with a single MMS write of a single symbolic variable in the following format:

12^H6800	= Variable 1	-32768 to 32767 for data

A Jbus Single Register Write to register 6800 to a Jbus device defined as Device ID 12 in the ECC should be done with a single MMS write of a single symbolic variable in the following format:

12^H6800	= Variable 1	-32768 to 32767 for data

A Modbus Block Write to registers 406800 to 406802 to a Modbus device defined as Device ID 12 in the ECC should be done with a single MMS write of a list of 3 individual symbolic variables in the following format:

12^H6800[3]	= Variable 1	-32768 to 32767 for data
*	= Variable 2	-32768 to 32767 for data
*	= Variable 3	-32768 to 32767 for data

A Jbus Block Write to registers 6800 to 6802 to a Jbus device defined as Device ID 12 in the ECC should be done with a single MMS write of a list of 3 individual symbolic variables in the following format:

12^H6800[3]	= Variable 1	-32768 to 32767 for data
*	= Variable 2	-32768 to 32767 for data
*	= Variable 3	-32768 to 32767 for data

A Modbus/Jbus Read from General Reference File 1 registers 2 to 4 from a Modbus/Jbus device defined as Device ID 12 in the ECC should be done with a single MMS read of a list of 3 individual symbolic variables in the following format:

12^F2[3]1	= Variable 1
*	= Variable 2
*	= Variable 3

A Modbus/Jbus Write to General Reference File 1 registers 2 to 4 to a Modbus/Jbus device defined as Device ID 12 in the ECC should be done with a single MMS write of a list of 3 individual symbolic variables in the following format:

12^F2[3]1	= Variable 1	-32768 to 32767 for data
*	= Variable 2	-32768 to 32767 for data
*	= Variable 3	-32768 to 32767 for data

A Modbus Scattered Read of registers 401002, 401004, 401008 from a Modbus device defined as Device ID 12 in the ECC should be done with a single MMS read of a list of 3 individual symbolic variables in the following format:

12^S1002	= Variable 1
12^S1004	= Variable 2
12^S1008	= Variable 3

A Jbus Scattered Read of registers 1002, 1004, 1008 from a Jbus device defined as Device ID 12 in the ECC should be done with a single MMS read of a list of 3 individual symbolic variables in the following format:

12^S1002	= Variable 1
12^S1004	= Variable 2
12^S1008	= Variable 3

A Modbus Secured Scattered Read of registers 401002, 401004, 401008 from a Modbus device defined as Device ID 12 in the ECC should be done with a single MMS read of a list of 3 individual symbolic variables in the following format:

12^Z3546^S1002	=Variable 1
12^Z3546^S1004	= Variable 2
12^Z3546^S1008	= Variable 3

3.4 ModbusTCP Client (Future)

The ECC will have the ability to initiate communications as a ModbusTCP client when configured to do so based on the Remote Device Connections Setup. The ECC will do all transactions based on a connection to TCP port 502 and will support the same Modbus function codes listed in the ModbusTCP Server Function Codes Section. Each read or write operation will be accompanied by a connect and a disconnect message over the Ethernet.

3.5 MMSTCP Client (Future)

The ECC will have the ability to initiate communications as a MMSTCP client when configured to do so based on the Remote Device Connections Setup. The ECC will do all transactions based on a connection to TCP port 102 and will support the MMS functionality explained in the MMSTCP Services Section. Each read or write operation will be accompanied by a connect and a disconnect message over the Ethernet.

3.6 SNTP Server (Future)

The ECC will have the ability to listen on TCP port 123 for an SNTP server to send time synchronization information to the ECC. This information will then update the ECC's internal time and will allow this updated internal time to be used in the time synchronization mechanism which will update all the attached devices (CM and RS485) to the ECC on configurable intervals.

3.7 FTP Server

The ECC has the ability to act as an FTP server. This capability will allow the ECC to listen on the Ethernet at TCP port 21 for file transfers. Utilizing this capability will allow a good mechanism for quick downloadable ECC basic setup, downloadable ECC firmware updates, and downloadable custom device HTML tables.

3.7.1 FTP Download for Basic Setup (Future)

The ECC will have the ability to accept an FTP download to accomplish limited setup changes/additions. The initial setup of the ECC through the CM display must already be completed to get the ECC configured properly on the TCP/IP network prior to attempting the setup download. Most any desktop PC running Windows NT/95/98 and using TCP/IP will have the capability to FTP a setup file to the ECC. The setup file will be an ASCII text file with a list of strings for the ECC to execute. The user will have to open an FTP session from within the DOS prompt and "put/send" the text file to the ECC. The text file must be named "setup.txt" and the user must login to the ECC FTP server with the administrator password (user name is ignored by the ECC). The following table shows what each line in the text file should be.

Line Number	Description
1	RS485 Port Baud Rate (1200, 2400, 4800, 9600, 19200, 38400)
2	RS485 Port Parity (0 = none, 2 = even)
3	RS485 Port Timeout in seconds (3 – 10)
4	RS485 Time Sync Interval in seconds (0 = disabled, 30 – 65535)
5	Device ID 2's RS485 Address (0 – 247)
6	Device ID 2's RS485 Protocol (4 = PowerLogic, 6 = Modbus, 11 = Jbus, any value other than these specified will remove this device from the list)
7	Device ID 3's RS485 Address (0 – 247)
8	Device ID 3's RS485 Protocol (4 = PowerLogic, 6 = Modbus, 11 = Jbus, any value other than these specified will remove this device from the list)
.	
66	Through Device ID 32's info

Table 33 – Basic Setup FTP File Format

The following shows what an example setup text file would look like.

```
9600
2
5
300
3
4
5
6
10
11
24
4
```

Note: A "Wizard" application could be provided here to automatically generate this file for the user.

3.7.2 FTP Download for Firmware Update

The ECC will have the ability to accept an FTP transfer to accomplish a firmware download. The ECC must be configured properly on the TCP/IP network prior to attempting the firmware download. Most any desktop PC running Windows NT/95/98 and using TCP/IP will have the capability to FTP the firmware file to the ECC. The user will have to open an FTP session from within the DOS prompt and "put/send" the firmware file to the ECC. The file will be named "firmware.bin" and the user must login to the ECC FTP server with the administrator password (user name is ignored by the ECC). The new firmware binary will be accepted by the ECC into DRAM space. Once the FTP transaction is complete, the firmware binary will be copied into flash, and the ECC will reset to load and run with the new image.

3.7.3 FTP Download for Custom Device View Tables (Future)

The ECC will have the ability to accept an FTP download to allow for five custom designed HTML device view pages. The ECC must be configured properly on the TCP/IP network prior to attempting the download. Most any desktop PC running Windows NT/95/98 and using TCP/IP will have the capability to FTP the file to the ECC. The HTML file will be an ASCII text file written in standard HTML language.

Note that it is up to the user to correctly construct the HTML page. The ECC will only confirm that there is a correct HTML title tag, and then accept the whole file as correct. Once the file is accepted, a link to the page will appear on the ECC Home page. The link name will be the page's title up to 32 characters.

The user will have to open an FTP session from within the DOS prompt and "put/send" the HTML file to the ECC. The user must login to the ECC FTP server with the administrator password (user name is ignored by the ECC). Once the file is accepted by the ECC, the HTML file's title will show up in the list on the ECC Home page.

3.7.3.1 Post FTP Download for Custom Device View Tables (Future)

The ECC will normally have the custom HTML pages loaded into DRAM at runtime. When a new one is downloaded, the ECC will update its image in DRAM then have to store the HTML page in a file in the CM. According to the CM Design Specification, the following table signifies each file for the pages.

File Type	Description	File Size	Record Size
35	HTML File #1	Dynamic	Static
36	HTML File #2	Dynamic	Static
37	HTML File #3	Dynamic	Static
38	HTML File #4	Dynamic	Static
39	HTML File #5	Dynamic	Static

Table 34 – Downloadable HTML Page Storage

Each downloadable HTML page will have to be buffered to fit the static record size. This means that the HTML page will have to be evenly divisible by 100 because each record size is limited to 100bytes.

4 Serial Communications

The ECC will have the ability to have its single RS485 port utilized for communications in combinations of the following: 2-wire, 4-wire, multi-protocol, master, slave (Future). To try to keep with the goal of having the user do as little setup as possible, the goal of the ECC RS485 logistics will be to have only two modes of operation. These two modes will be able to be as "dynamic" as possible and respond/react to the protocols supported as needed. These two modes will be called "4-wire Smart Mode" and "2-wire Smart Mode".

4.1 4-wire Smart Mode

The 4-wire Smart Mode will be the default and primary setup for the ECC RS485 communications. This mode will allow for full-duplex bi-directional communications when needed. The ECC will be able to "know" when the port is being utilized as a slave or master by reacting to what is connected to it during communications. This "knowledge" also includes the ability to determine between SyMax, Modbus, and Jbus protocols on the fly. This ability helps the ECC adept even better to the use of "mixed-protocol" devices.

4.2 2-wire Smart Mode

The 2-wire Smart Mode will be the secondary setup for the ECC RS485 communications. This mode will allow for half-duplex communications only. This means that all the devices (master and slaves) together share the communication signals and can only communicate one at a time. In this mode, just like the 4-wire Smart Mode, the ECC will be able to "know" when the port is being utilized as a slave or master by reacting to what is connected to it during communications. This mode will accommodate Modbus/Jbus 2-wire communications only. This ability also helps ease the ECC setup for the user.

5 Inter-processor Communications

The primary purpose of the ECC is for high-speed communications to the CM the ECC is inserted into. This inter-processor communications will be based on a high-speed dual-port RAM interface between the bus of the ECC's processor and the bus of the CM's processor. The actual speed of the communications will be determined during development/testing.

5.1 Inter-processor Communications Theory of Operation

The inter-processor communications will be based on a proprietary "flavor" of Modbus. This choice was made since the Modbus protocol is one already well adapted into both devices, and since the characteristics of the protocol fit the dual-port RAM interface fairly well. Because the CM will have the ability to initiate communications and cause a potential for full-duplex, bi-directional communications (collisions) through the dual-port RAM in the ECC, the dual-port RAM will have to be split into four main memory regions.

One half (upper half), from the point-of-view of the ECC, will be the incoming side for communications from the CM. This half will then be split into two equal memory regions that will be designated for incoming commands and incoming replies. The other half (lower half), again from the point-of-view of the ECC, will be the outgoing side for communications to the CM. This half will also be split into two more equal memory regions that will be designated for outgoing commands and outgoing replies.

To ease the message management on the CM and the ECC, no more than one command message per direction should be outstanding at any given time. There may also need to be "control" messages between just the CM and the ECC for movement of specific types of data unknown to the "outside". In these cases, the CM and the ECC should use a Modbus slave ID of 255 in the Modbus command message to signify to the device receiving the message that it is a "control" message.

As previously mentioned, there will be a slight adaptation of the Modbus packet structure. There will be two bytes (one word) added as the first part of the message that will be the count of the bytes contained in the rest of the message. The rest of the message will then be a regularly formatted Modbus message. The ECC will read the CM's RS485 slave port address out of the CM at boot and that address will be used for MBTCP communications to the CM the ECC is inserted into.

After the ECC fills the appropriate region of the dual-port RAM with the appropriate message needed, the offset address of 0x7FF should be written with the appropriate interrupt ID to trigger an interrupt to the CM processor. Likewise, after the CM fills the appropriate region of the dual-port RAM with the appropriate

message needed, the offset address of 0x7FE should be written with the appropriate interrupt ID to trigger an interrupt to the ECC processor.

The following diagram shows the memory map of the dual-port ram followed by an explanation of each of the numbered memory regions.

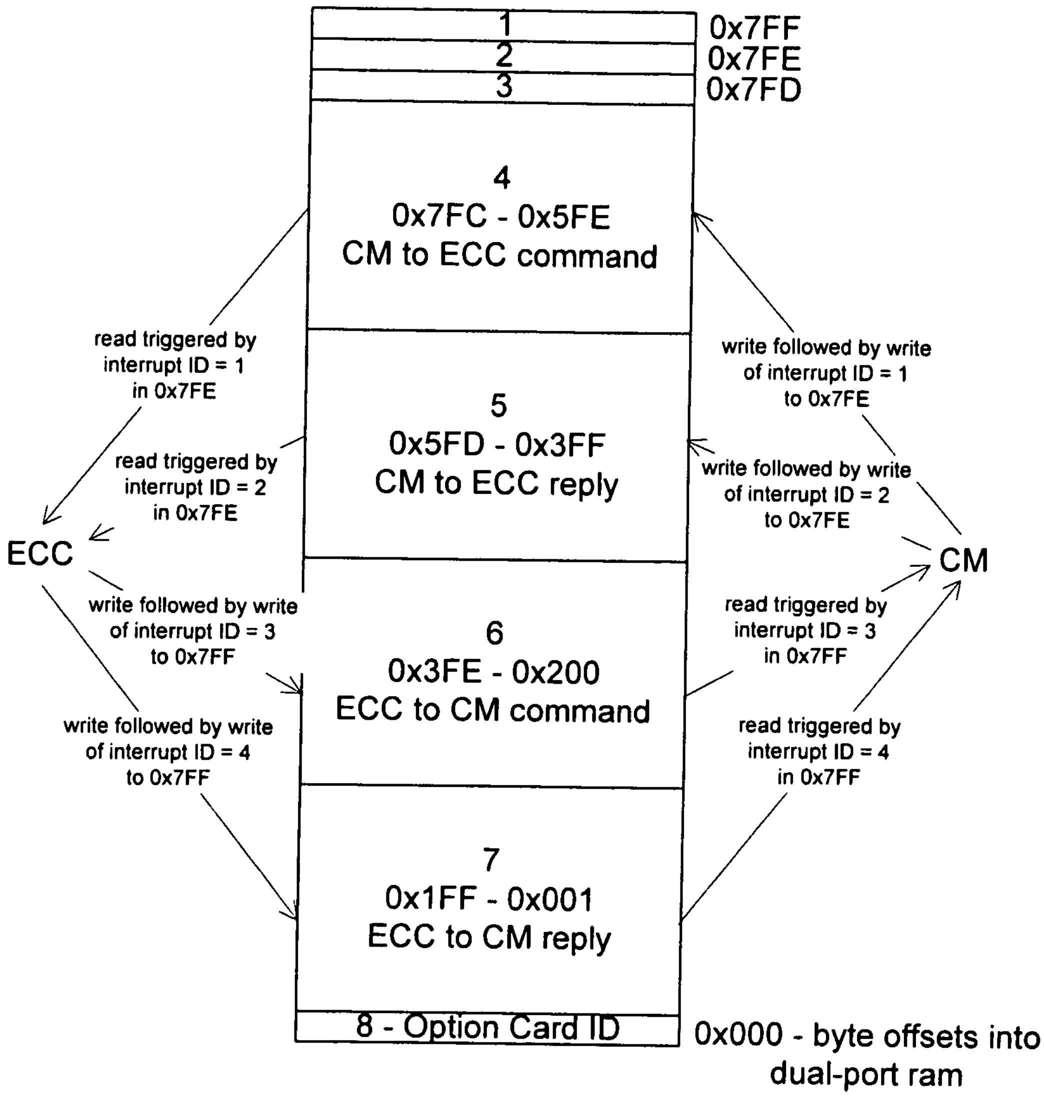

Figure 16 - Dual-Port Ram Memory Map

Memory Region	Description
1	The CM writes the interrupt ID here to trigger an interrupt to the ECC. Or The ECC reads this address after being triggered by the interrupt to see what the interrupt ID is.
2	The ECC writes the interrupt ID here to trigger an interrupt to the CM. Or The CM reads this address after being triggered by the interrupt to see what the interrupt ID is.
3	Reserved
4	The ECC, after interrupt and reading the interrupt ID from 0x7FE, will read this memory region from offset 0x600 for number of bytes shown in 0x5FE and 0x5FF to get a Modbus command message from the CM. Or The CM, before writing the appropriate interrupt ID value in 0x7FE, will write the Modbus command message in this memory region from offset 0x600 and write the number of bytes in the message into 0x5FE and 0x5FF.
5	The ECC, after interrupt and reading the interrupt ID from 0x7FE, will read this memory region from offset 0x401 for number of bytes shown in 0x3FF and 0x400 to get a Modbus reply message from the CM. Or The CM, before writing the appropriate interrupt ID value in 0x7FE, will write the Modbus reply message in this memory region from offset 0x401 and write the number of bytes in the message into 0x3FF and 0x400.
6	The CM, after interrupt and reading the interrupt ID from 0x7FF, will read this memory region from offset 0x202 for number of bytes shown in 0x200 and 0x201 to get a Modbus command message from the ECC. Or The ECC, before writing the appropriate interrupt ID value in 0x7FF, will write the Modbus command message in this memory region from offset 0x202 and write the number of bytes in the message into 0x200 and 0x201.
7	The CM, after interrupt and reading the interrupt ID from 0x7FF, will read this memory region from offset 0x003 for number of bytes shown in 0x001 and 0x002 to get a Modbus reply message from the ECC. Or The ECC, before writing the appropriate interrupt ID value in 0x7FF, will write the Modbus reply message in this memory region from offset 0x003 and write the number of bytes in the message into 0x001 and 0x002.
8	Option Card Identification

Table 35 - Dual-Port Ram Memory Region Descriptions

5.2 Inter-processor Communications Boot-up Sequence

Because the entire ECC configuration will be stored in the CM the ECC is inserted into, the ECC will have to be able to get this information from the CM at every boot-up. Also, if the user changes the initial setup information (IP Address, IP Subnet Mask, IP Router, or Ethernet Physical Connection) via the CM display, the CM will have to re-boot the ECC to have the new settings take effect.

At initial power-up, the ECC will set its CM option card identifier in the lowest address of the dual-port RAM as soon as possible before starting any of the main firmware tasks. At this point, the ECC will finish its boot sequence based on the last known good initial setup information. This information will be held in the first thirteen bytes of the EEPROM based on the following table.

Byte Offset into EEPROM	Description
0	IP Address – 1st Octet
1	IP Address – 2nd Octet
2	IP Address – 3rd Octet
3	IP Address – 4th Octet
4	IP Sub-net Mask – 1st Octet
5	IP Sub-net Mask – 2nd Octet
6	IP Sub-net Mask – 3rd Octet
7	IP Sub-net Mask – 4th Octet
8	IP Router Address – 1st Octet
9	IP Router Address – 2nd Octet
10	IP Router Address – 3rd Octet
11	IP Router Address – 4th Octet
12	Ethernet Physical Connection

Table 37 – Last Known Good Boot State

After the completion of the boot sequence based on the last known good information, the ECC will then begin the first of a sequence of Modbus reads getting the basic ECC setup information from the CM. If the ECC finds a difference between what it has as the last known good information and what the CM has as the initial setup information, the ECC will update its last known good information and request a reboot of the CM. Once there is a match between the initial setup information between the ECC and the CM, the ECC will finish its boot sequence with all the appropriate basic setup information and continue to request any advanced information (Custom HTML pages) from the CM.

5.3 CM Communications Card Identification

The CM option card identifier used by the ECC is defined by the CM and is the value of six according to the CM Design Specification. This number will be placed in the lowest offset of the dual-port RAM by the ECC as soon as possible during boot-up.

6 Manufacturing Parameters

The ECC will need some specific parameters set for each unit during manufacturing. Some of the parameters that appear to be needed at this time are the Organizationally Unique Identifier (OUI), the serial number, the model number, the hardware revision number, and the date of manufacture (DOM).

6.1 Organizationally Unique Identifier (OUI)

An OUI is a 24 bit globally unique assigned number referenced by various standards. An OUI is used in the family of 802 LAN standards (Ethernet, Token Ring, etc). The OUI defined in IEEE Std 802-1990 can be used to generate 48 bit Universal LAN MAC addresses to identify LAN and MAN stations uniquely, and Protocol Identifiers to identify public and private protocols. These are used in Local and Metropolitan Area Network applications. The relevant standards include CSMA/CD (IEEE Std 802.3, ISO 8802-3), Token Bus (IEEE Std 802.4, ISO 8802-4), Token Ring (IEEE Std 802.5, ISO/IEC 8802-5), IEEE Std 802.6 (ISO/IEC DIS 8802-6), and FDDI (ISO 9314-2).

The ECCs will carry Square D's IEEE OUI "signature" of 00-80-67. The Power Management Operations (PMO) has a range of the OUIs for Ethernet MAC addresses and will be 00-80-67-80-00-00 through 00-80-67-FF-FF-FF. This range gives PMO a total of 8,388,608 MAC addresses to distribute and be used among our Ethernet devices.

The unique MAC addresses will have to be able to be assigned to each individual ECC during manufacturing. There are a few possibilities to accomplish this. One possibility is to have the MAC assignment done by writing the EEPROM before board manufacture and/or have an EEPROM socket for removal of the EEPROM to have the ability to re-write if needed. The other option would be to have firmware capabilities to set/change the MAC address when needed. This option requires more functionality in the firmware and also leaves open the potential of "lost" or duplicate MAC addresses. The following table shows the storage format of the MAC address in the EEPROM on the ECC.

Byte Offset into EEPROM	Description
13	Byte one of the MAC address (most significant)
14	Byte two of the MAC address
15	Byte three of the MAC address
16	Byte four of the MAC address
17	Byte five of the MAC address
18	Byte six of the MAC address (least significant)

Table 38 – MAC Address Storage Map

6.2 Serial Number

Another piece of information that will need to be stored in the ECC EEPROM will be a serial number. Here again, there are a few possibilities to accomplish this. One possibility is to have the serial number assignment done by writing the EEPROM before board manufacture and/or have an EEPROM socket for removal of the EEPROM to have the ability to re-write if needed. Another option would be to have firmware capabilities to set/change the serial number when needed. A third option would be to come up with a scheme to derive a serial number from the MAC address. By having the MAC address set, the serial number would also inherently be set. The following table shows the storage format of the 32 bit value of the serial number in the EEPROM on the ECC.

Byte Offset into EEPROM	Description
19	Byte one of the Serial Number (most significant)
20	Byte two of the Serial Number
21	Byte three of the Serial Number
22	Byte four of the Serial Number (least significant)

Table 39 – Serial Number Storage Map

6.3 Model Number

Another piece of information that will need to be stored in the ECC EEPROM will be a model number. Here again, there are a few possibilities to accomplish this. One possibility is to have the model number assignment done by writing the EEPROM before board manufacture and/or have an EEPROM socket for removal of the EEPROM to have the ability to re-write if needed. The other option would be to have firmware capabilities to set/change the model number when needed. The following table shows the storage format of the 16 bit value of the model number in the EEPROM on the ECC.

Byte Offset into EEPROM	Description
23	Byte one of the Model Number (most significant)
24	Byte two of the Model Number (least significant)

Table 40 – Model Number Storage Map

6.4 Hardware Revision Number

Another piece of information that will need to be stored in the ECC EEPROM will be a hardware revision number. Here again, there are a few possibilities to accomplish this. One possibility is to have the hardware revision number assignment done by writing the EEPROM before board manufacture and/or have an EEPROM socket for removal of the EEPROM to have the ability to re-write if needed. The other option would be to have firmware capabilities to set/change the hardware revision number when needed. The following table shows the storage format of the four ASCII characters that represent the hardware revision number in the EEPROM on the ECC.

Byte Offset into EEPROM	Description
25	ASCII character one of the Hardware Revision Number
26	ASCII character two of the Hardware Revision Number
27	ASCII character three of the Hardware Revision Number
28	ASCII character four of the Hardware Revision Number

Table 41 – Model Number Storage Map

6.5 Date of Manufacture (DOM)

Another piece of information that will need to be stored in the ECC EEPROM will be a Date of Manufacture value. Here again, there are a few possibilities to accomplish this. One possibility is to have the date assignment done by writing the EEPROM before board manufacture and/or have an EEPROM socket for removal of the EEPROM to have the ability to re-write if needed. The other option would be to have firmware capabilities to set/change the date when needed. The following table shows the storage format of the date of manufacture in the EEPROM on the ECC.

Byte Offset into EEPROM	Description
29	Month byte of the DOM
30	Day byte of the DOM
31	Year byte of the DOM, since 1900
32	Hour byte of the DOM
33	Minute byte of the DOM
34	Seconds byte of the DOM

Table 42 – DOM Storage Map

6.6 Manufacture Process Info

The final piece of information that will need to be stored in the ECC EEPROM will be an area of memory that will be used as a "scratch pad" for use during Manufacturing. This area will be written during manufacturing/testing of each unit. The following table shows the region in the EEPROM dedicates for this purpose.

Byte Offset into EEPROM	Description
35 – 74	Manufacturing "scratch pad"

Table 43 – Manufacturing Process Info Storage Map

7 Environmental

The ECC design will attempt to meet the same environmental requirements as the CM. This will prove difficult, however, due to the lack of availability of Industrial Ethernet components capable of doing the needed speeds/interfaces. The following table will show acceptable ranges for the environmental requirements that the ECC will attempt to meet.

Description	Values
Operating Temperature Range	-40°C to +70°C
Storage Temperature Range	-40°C to +85°C
Humidity Rating	5% to 95% rh (non-condensing)
Vibration	Equivalent to CM

Table 44 – Environmental Requirements

8 Agency Compliance

The ECC design will attempt to meet the same agency compliance as the CM. The following table shows the agency compliance that the ECC will attempt to meet.

Type		Description
Electromagnetic Interference	Radiated Emissions	FCC Part 15 Class A/CE Heavy Industrial
Electromagnetic Interference	Conducted Emissions	FCC Part 15 Class A/CE Heavy Industrial
Electrostatic Discharge	Air Discharge	IEC pub 1000-4-2 level 4
Immunity to Electrical Fast Transients	Transients	ANSI/IEEE C37.90A, IEC pub 1000-4-4 level 3
Immunity to Electrical Fast Transients	Impulse Wave	IEC pub 1000-4-5 level 4
Breakdown Voltage	Dielectric Withstand	UL 508, CSA C22.2-14-M1987, IEC pub 1000-4
Immunity to Radiated Fields	RFI	IEC pub 801.3 level 4
Safety	USA	UL 508
Safety	Canada	CSA C22.2-14-M1987
Safety	Europe	VDE/TUV Equivalent to UL508

Table 45 – Agency Compliance

9 System Manager Software Drivers

The ECC will be designed in such a way to be as completely compatible as possible with the existing SMS PowerLogic Network Server MMSTCP and ModbusTCP Drivers. This will allow the integration of the new communications device without major impact on SMS.

10 ECC Operating System

The operating system used in the ECC design will be the pSOSystem operating system from Integrated Solutions, Inc. (ISI). pSOSystem has been established as a leading real-time operating system (RTOS) for embedded applications. pSOSystem is a modular, high-performance, real-time operating system, designed specifically for embedded microprocessors. A few of the main components that will be utilized during development will be the pSOSystem pSOS+ Real-time Multi-tasking Kernel, pNA+ TCP/IP Protocol Stack, pREPC+ ANSI C Standard Library, pROBE+, and pMONT+. All the firmware work will be done in ISI's pRISM+ development environment. For detailed information on these pSOSystem and pRISM+ components, refer to the ISI pSOSystem and pRISM+ documentation.

11 ECC Register List

The ECC will have nearly all configuration data stored in the CM it is inserted into. The required storage size will need to be a minimum of 300 words (registers). The following is the "quick list" of the registers.

Register	HiByte	LoByte
500	IP Address 1st Octet (0 – 255)	IP Address 2nd Octet (0 – 255)
501	IP Address 3rd Octet (0 – 255)	IP Address 4th Octet (0 – 255)
502	IP Sub-net Mask 1st Octet (0 – 255)	IP Sub-net Mask 2nd Octet (0 – 255)
503	IP Sub-net Mask 3rd Octet (0 – 255)	IP Sub-net Mask 4th Octet (0 – 255)
504	IP Router Address 1st Octet (0 – 255)	IP Router Address 2nd Octet (0 – 255)
505	IP Router Address 3rd Octet (0 – 255)	IP Router Address 4th Octet (0 – 255)
506	Ethernet physical connection (0 = UTP, 1 = Fiber HD, 2 = Fiber FD)	
507	ModbusTCP Client Timeout in seconds (5 – 60)	MMSTCP Client Timeout in seconds (5 – 60)
508	HTML Access token expiration time in minutes (1 – 255)	
509	RS485 Timeout in seconds (3 – 10)	DPR Timeout in seconds (3 – 10)
510	CM/RS485 Time Synchronization Interval in seconds (0 = disabled, 30 – 65535)	
511	HTML default language type (0 = English, 1 = French, 2 = Spanish)	
512	RS485 Baud Rate (1200, 2400, 4800, 9600, 19200, 38400)	
513	RS485 Parity (0 = none, 2 = even)	RS485 Mode (1 = 2-wire Smart, 2 = 4-wire Smart)
514	Admin password ASCII character 1	Admin password ASCII character 2
515	Admin password ASCII character 3	Admin password ASCII character 4
516	Admin password ASCII character 5	Admin password ASCII character 6
517	Admin password ASCII character 7	Admin password ASCII character 8
518	Pass1 password ASCII character 1	Pass1 password ASCII character 2
519	Pass1 password ASCII character 3	Pass1 password ASCII character 4
520	Pass1 password ASCII character 5	Pass1 password ASCII character 6
521	Pass1 password ASCII character 7	Pass1 password ASCII character 8
522	Pass1 Password HTML Page Access Bitmap (Most Significant Word)	

523	Pass1 Password HTML Page Access Bitmap (2nd Most Significant Word)	
524	Pass1 Password HTML Page Access Bitmap (2nd Least Significant Word)	
525	Pass1 Password HTML Page Access Bitmap (Least Significant Word)	
526	Pass2 password ASCII character 1	Pass2 password ASCII character 2
527	Pass2 password ASCII character 3	Pass2 password ASCII character 4
528	Pass2 password ASCII character 5	Pass2 password ASCII character 6
529	Pass2 password ASCII character 7	Pass2 password ASCII character 8
530	Pass2 Password HTML Page Access Bitmap (Most Significant Word)	
531	Pass2 Password HTML Page Access Bitmap (2nd Most Significant Word)	
532	Pass2 Password HTML Page Access Bitmap (2nd Least Significant Word)	
533	Pass2 Password HTML Page Access Bitmap (Least Significant Word)	
534	Pass3 password ASCII character 1	Pass3 password ASCII character 2
535	Pass3 password ASCII character 3	Pass3 password ASCII character 4
536	Pass3 password ASCII character 5	Pass3 password ASCII character 6
537	Pass3 password ASCII character 7	Pass3 password ASCII character 8
538	Pass3 Password HTML Page Access Bitmap (Most Significant Word)	
539	Pass3 Password HTML Page Access Bitmap (2nd Most Significant Word)	
540	Pass3 Password HTML Page Access Bitmap (2nd Least Significant Word)	
541	Pass3 Password HTML Page Access Bitmap (Least Significant Word)	
542	RS485 Device Definitions - Protocol (3 = PowerLogic, 8 = Modbus)	RS485 Device Definitions - Address (0 – 254)
543 – 604	62 more registers for up to 62 more Device definitions	
605	Number of viewable defined devices, includes CM that the ECC is attached to (1 – 62)	
606	Web Page Passwords Disabled (Most Significant Word)	
607	Web Page Passwords Disabled (Least Significant Word)	
608	MAC Address Byte 1	MAC Address Byte 2
609	MAC Address Byte 3	MAC Address Byte 4
610	MAC Address Byte 5	MAC Address Byte 6
611	Serial Number Byte 1 (32 bit number)	Serial Number Byte 2
612	Serial Number Byte 3	Serial Number Byte 4
613	Model Number (16 bit number)	
614	Hardware Revision Number Character 1	Hardware Revision Number Character 2
615	Hardware Revision Number Character 3	Hardware Revision Number Character 4
616	Date of Manufacture Month Byte	Date of Manufacture Day Byte
617	Date of Manufacture Year Byte, since 1900	Date of Manufacture Hour Byte
618	Date of Manufacture Minutes Byte	Date of Manufacture Seconds Byte
619 – 638	Scratch Pad/Process Area	
639	Firmware Version Number (2000 = 2.000)	
640	Refresh Rate for Static Tables in seconds (1 – 300)	
641	Force Manufacturing Parameters Flag (AAAA means the ECC excepts the manufacturing parameters from the register list)	
642 – 999	Reserved	

Table 46 – ECC Register List

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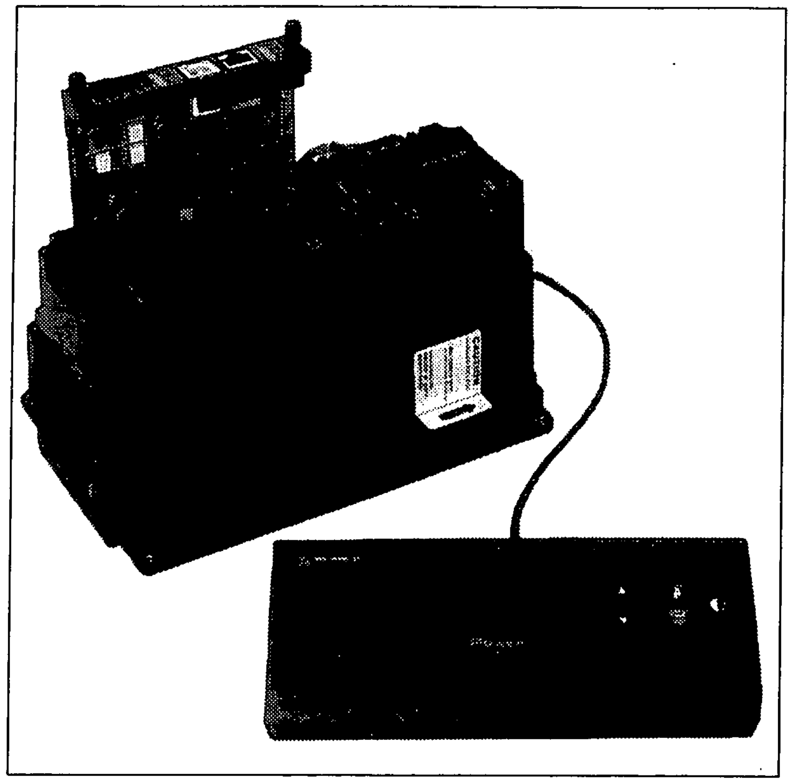
Instruction Bulletin

63230-304-200

POWERLOGIC® Ethernet Communications Card



Merlin Gerin
Modicon
Square D
Telemecanique

Schneider Electric

NOTICE

Read these instructions carefully and look at the equipment to become familiar with the device before trying to install, operate, service, or maintain it. The following special messages may appear throughout this bulletin or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.

The addition of either symbol to a "Danger" or "Warning" safety label indicates that an electrical hazard exists which will result in personal injury if the instructions are not followed.

This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

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⚠ DANGER

DANGER indicates an imminently hazardous situation which, if not avoided, **will result in** death or serious injury.

⚠ WARNING

WARNING indicates a potentially hazardous situation which, if not avoided, **can result in** death or serious injury.

⚠ CAUTION

CAUTION indicates a potentially hazardous situation which, if not avoided, **can result in** minor or moderate injury.

CAUTION

CAUTION, used without the safety alert symbol, indicates a potentially hazardous situation which, if not avoided, **can result in** property damage.

NOTE: Provides additional information to clarify or simplify a procedure.

PLEASE NOTE

Electrical equipment should be installed, operated, serviced, and maintained only by qualified personnel. This document is not intended as an instruction manual for untrained persons. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this manual.

Class A FCC Statement

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designated to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

CONTENTS

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LIST OF FIGURES

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LIST OF TABLES

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CHAPTER 1—INTRODUCTION

CHAPTER CONTENTS

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OVERVIEW

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This document contains installation and operation instructions for the POWERLOGIC® Ethernet Communication Card (ECC). Before installing the ECC (shown in Figure 1–1), you should have a general understanding of the POWERLOGIC Power Monitoring and Control System and related products and technology.

For more information about the POWERLOGIC System, refer to the following documents:

- POWERLOGIC System Architecture and Application Guide
- POWERLOGIC System Manager Software 3000 User's Guide
- POWERLOGIC Circuit Monitor Series 4000 Instruction Bulletin

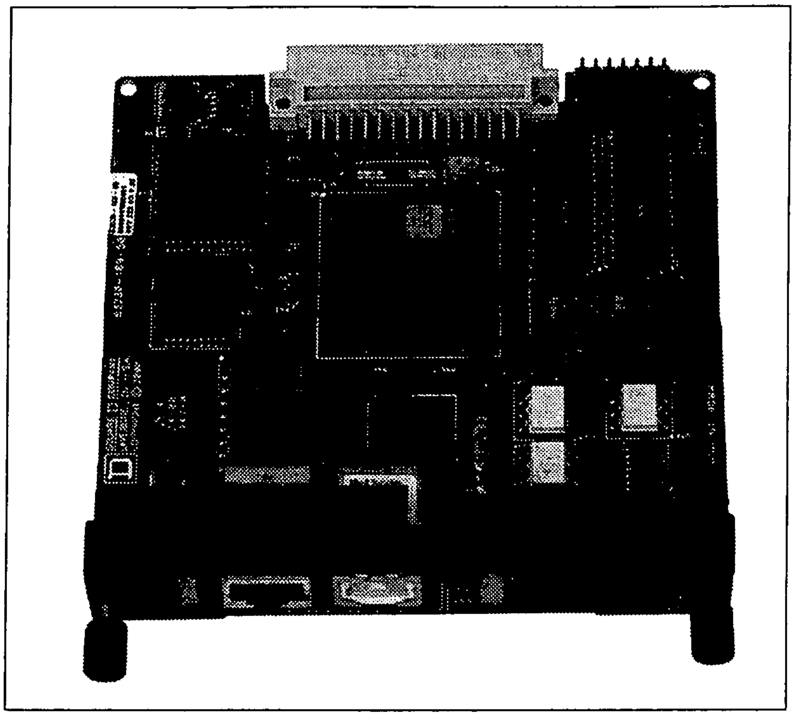

Figure 1–1 Ethernet Communications Card

WHAT IS AN ETHERNET COMMUNICATION CARD?

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The POWERLOGIC Ethernet Communication Card (ECC) is an optional add-on card for the Series 4000 Circuit Monitor. The ECC inserts into an option slot in the circuit monitor. The primary function of the ECC is to provide a fast, direct Ethernet communication connection for the Series 4000 Circuit Monitor and allow Ethernet gateway functionality to a wide variety of POWERLOGIC-compatible MODBUS, JBUS, and/or SY/MAX devices. A typical application example is shown in Figure 1–2.

The ECC also allows you to access custom HTML pages (stored in the circuit monitor) via a standard web browser. The pages are best viewed using Internet Explorer version 5.0 or higher. These HTML pages may display information from the host circuit monitor and/or daisy-chained devices.

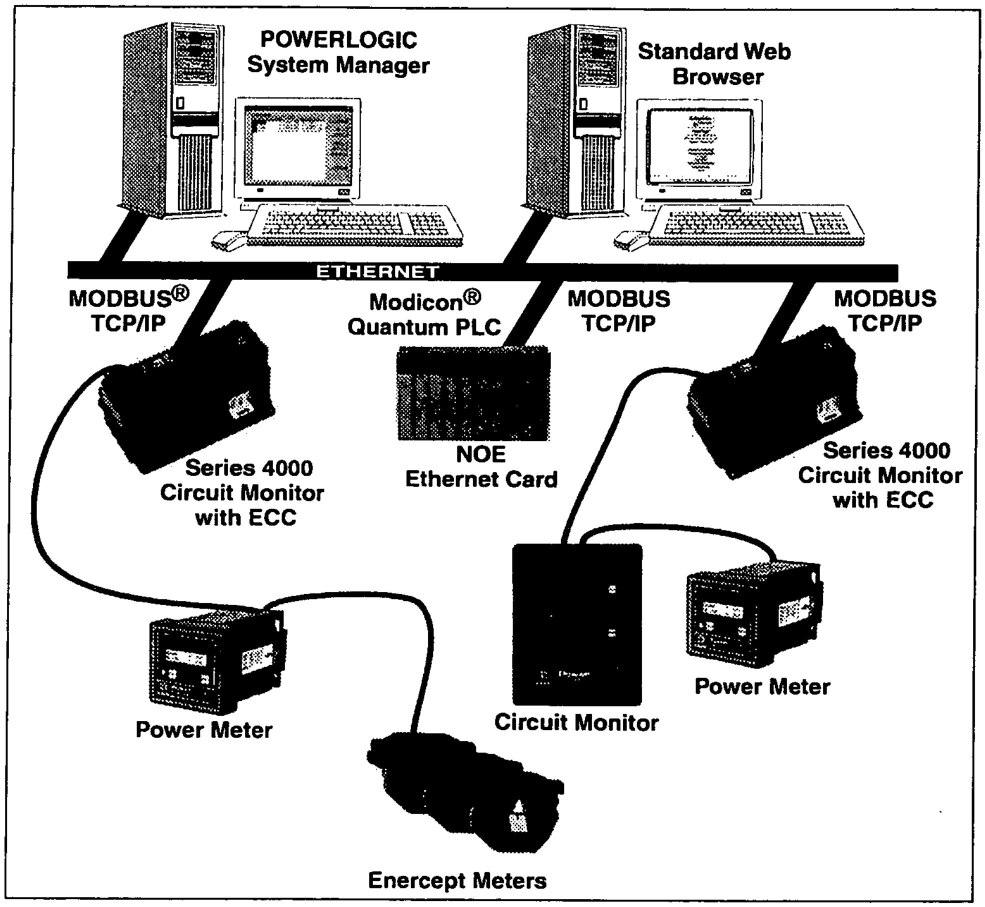

Figure 1–2 **System architecture example showing Series 4000 Circuit Monitors with Ethernet Communications Cards installed**

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CHAPTER 2—SAFETY PRECAUTIONS

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This chapter contains important safety precautions that must be followed before attempting to install, service, or maintain electrical equipment. Carefully read and follow the safety precautions outlined below.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, BURN, OR EXPLOSION

- Only qualified workers should install this equipment. Such work should be performed only after reading this entire set of instructions.
- NEVER work alone.
- Before performing visual inspections, tests, or maintenance on this equipment, disconnect all sources of electric power. Assume that all circuits are live until they have been completely de-energized, tested, and tagged. Pay particular attention to the design of the power system. Consider all sources of power, including the possibility of backfeeding.
- Turn off all power supplying the Series 4000 Circuit Monitor and the equipment in which it is installed before installing and wiring the ECC. Be aware that the circuit monitor may be connected to a separate power source derived from the equipment in which it is installed.
- Also turn off all power supplying any option card already installed in the Series 4000 Circuit Monitor before installing and wiring the ECC.
- Beware of potential hazards, wear personal protective equipment, and carefully inspect the work area for tools and objects that may have been left inside the equipment.
- The successful operation of this equipment depends upon proper handling, installation, and operation. Neglecting fundamental installation requirements may lead to personal injury as well as damage to electrical equipment or other property.

Failure to observe these instructions will result in death or serious injury.

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CHAPTER 3—GETTING STARTED

CHAPTER CONTENTS

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OVERVIEW

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With a few simple set up steps, you can use your ECC "right out of the box" to fully monitor the Series 4000 Circuit Monitor into which you will install the ECC. To do so, follow steps 1 through 8 below.

To install and set up the ECC for full functionality, complete the remaining steps.

1. The "host" circuit monitor is the Series 4000 Circuit Monitor into which the ECC will be installed. Turn off all power supplying the host circuit monitor and the equipment in which it is installed (see "Chapter 2—Safety Precautions" on page 5 and the safety precautions listed under "Installing The ECC" on page 13). Be aware that the circuit monitor may be connected to a separate power source derived from the equipment in which it is installed.
2. Install the ECC into the circuit monitor (for details, see "Installing The ECC" on page 13).
3. Wire the ECC (see "Wiring" on page 16).
4. If the host circuit monitor is mounted in an enclosure, make sure to remove all tools from the enclosure. Then install all covers and close all doors to the enclosure.
5. Restore power to the circuit monitor and any other equipment you de-energized to install and wire the ECC (see page 20).
6. Set up the following Ethernet parameters from the Series 4000 Circuit Monitor display (see "Setting Up The ECC Via The Series 4000 Circuit Monitor Display" on page 22):
   - IP Address
   - Subnet Mask
   - Router Address
   - Ethernet Port Type

   NOTE: To set up the ECC via the circuit monitor, the circuit monitor must be running firmware version 10.30 or higher.
7. Launch a standard web browser.
8. Type the IP address (for example, 163.196.212.89) into the URL field.
9. Log in with the administrator password (the default is "admin") and you are ready to configure or view the Series 4000 Circuit Monitor HTML pages.

To fully set up the ECC and use its monitoring, password administration, and diagnostic features, follow the remaining steps:

1. Modify Ethernet parameters (see "Communications Settings" on page 26).
2. Set up the serial communication port (see "RS-485 Serial Port Setup" on page 26).
3. Identify the RS-485 daisy-chained devices (see "Device List" on page 27).
4. Configure user passwords (see "Password Administration" on page 30).
5. Perform advanced setup if necessary (see "Advanced Setup" on page 31).

DEFAULT SETTINGS

Table 3–1 shows available values for ECC parameters and default values for those parameters.

Table 3–1: ECC Parameters and Default Values

Parameter	Value Range	Selection Description	Default
Password Administration 1. Administrator 2. Users 3. Access Level	1. Up to 8 alphanumeric characters 2. Up to 8 alphanumeric characters 3. None, Read Only, Full	1. Master password account 2. 3 Users' password accounts 3. User's access level for that page	1. admin 2. master, engineer, operator 3. See page 30 for details.
Communications Settings—RS-485 1. Baud Rate 2. Parity 3. Mode	1. 1200, 2400, 4800, 9600, 19200, 38400 2. Even, None 3. 4-Wire, 2-Wire	1. RS-485 Baud Speed 2. Parity 3. 4–wire or 2–wire daisy-chained devices	1. 9600 2. Even 3. 4-Wire
HTML User Timeout	1–255 Minutes	Maximum time allowed for a user to stay idle before the ECC expires that user's access.	10 minutes
Timeout for Circuit Monitor	3 to 10 Seconds	Maximum time ECC will wait for requested information from the CM4000.	3 seconds
Timeout for RS-485 Port	3 to 10 Seconds	Maximum time the ECC will wait for requested information from the RS-485 daisy-chained devices.	5 seconds
Number of Viewable Devices	2 to 64	Number of available device identification slots displayed on the Device List HTML page.	16
Instantaneous Readings Refresh Rate	5 to 300 seconds	Update refresh rate for the ECC to poll information from the CM4000 and put in the instantaneous reading table.	10 seconds

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CHAPTER 4—INSTALLATION

CHAPTER CONTENTS

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DESCRIPTION

This section identifies ECC components and provides installation instructions. Figure 4–1 shows the components of the ECC. Table 4–1 identifies those components and explains their functions.

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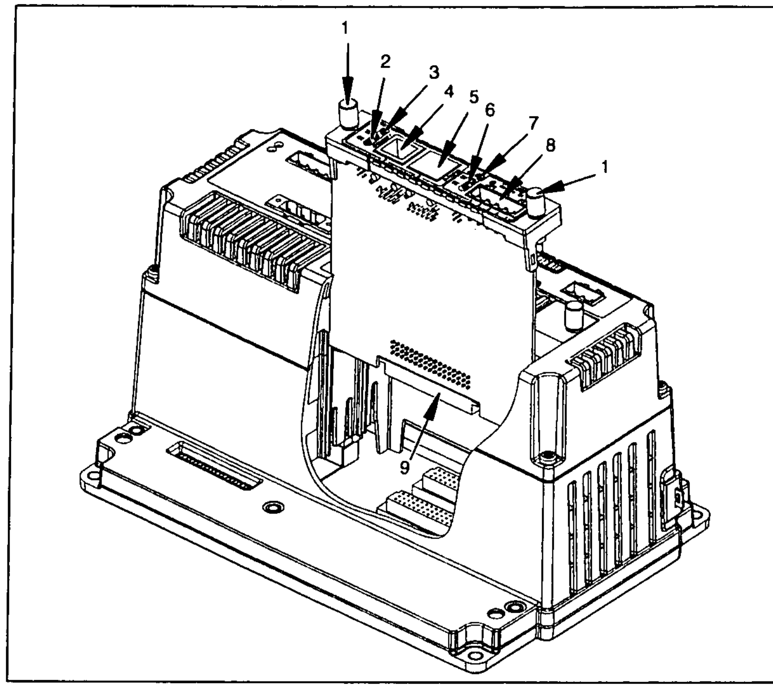

Figure 4–1 Identifying ECC components

Table 4–1: Ethernet Communication Card Components

Ref. No.	Item	Description
1	Retaining Screws	These screws secure the option card to the Series 4000 Circuit Monitor.
2	Ethernet Port LEDs	A yellow LED illuminates when the ECC is receiving data (RX) and a green LED illuminates when data is transmitted (TX).
3	Ethernet Link LED	This LED illuminates yellow steadily when there is a proper Ethernet connection.
4	10/100 BaseT Twisted Pair Port	This port drives a twisted pair cable up to 328 ft. (100 m). This port has a standard RJ-45 connector.
5	100BaseFX Port	The port is a duplex LC connector receptacle and is compatible with 1300 nm wavelength multimode fiber connections. The ECC on-board fiber-optic port allows the CM4000 to communicate with a fiber-optic based Ethernet LAN.
6	RS-485 LEDs	The yellow LED illuminates when the RS-485 port is receiving data (RX); the green LED illuminates when the RS-485 port is transmitting data (TX). Both LEDs flicker intermittently if there is a configuration error.
7	Power LED	This green LED illuminates steadily when power is received from the CM4000.
8	RS-485 Port	Used for communication with daisy-chained devices.
9	ECC/CM4000 Connector	This socket connects the ECC to the host Series 4000 Circuit Monitor.

INSTALLING THE ECC

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This section provides information on installing the ECC, including communications wiring.

The ECC is designed as a plug-and play accessory for the CM4000. Follow these instructions to install the ECC into the circuit monitor.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, BURN, OR EXPLOSION

- Turn off all power supplying the circuit monitor and the equipment in which it is installed before working on it. Be aware that the circuit monitor may be connected to a separate power source derived from which the equipment is installed.
- Use a properly rated voltage sensing device to confirm that all power is off.

Failure to follow these instructions will result in death or serious injury.

1. Turn off all power to the circuit monitor and the equipment in which it is installed. To turn off power to the circuit monitor, do this:
   a. Disconnect the metered voltage either by removing the fuses from the potential transformer (PT secondaries) circuits or by turning off the voltage disconnect switch.
   b. Short circuit the current transformer (CT) secondaries to remove the metered current.
   c. Turn off the control power and any power sources to the auxiliary inputs and outputs.
   d. Turn off power to any option cards already installed in the circuit monitor.
   e. Always use a properly rated voltage sensing device to confirm that power is off.

CAUTION

ESD-SENSITIVE COMPONENTS

Use an anti-static or grounding strap (customer-supplied) to ground yourself and discharge any static charge before installing the ECC. Static can damage electrostatic discharge-sensitive components in the circuit monitor and its accessories.

Failure to follow this instruction can result in equipment damage.

2. To discharge static, follow the instructions that come with your anti-static or grounding strap.

   NOTE: We recommend using an anti-static or grounding strap until you have completed installation of the ECC.

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3. On option slot A (Figure 4–2) of the circuit monitor, loosen the two retaining screws and remove the dust cover (Figure 4–3). Retain the dust cover for future use.

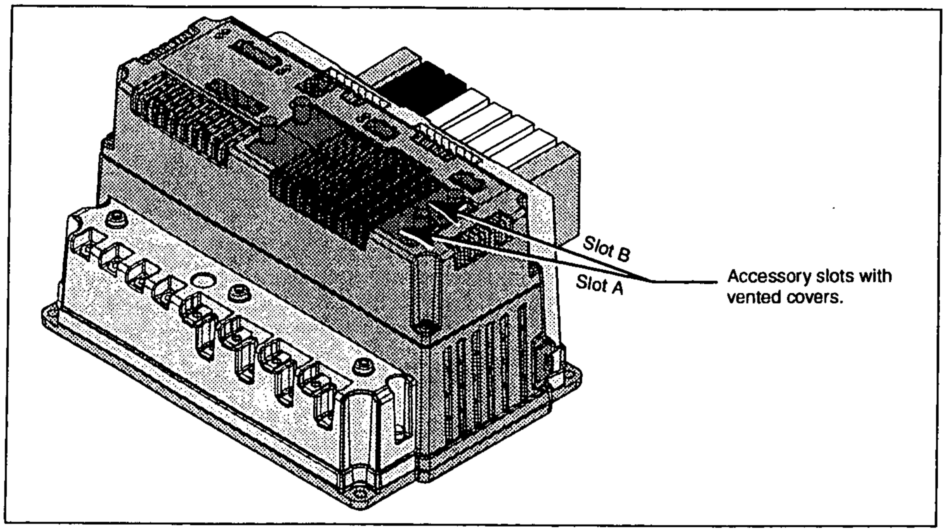

Figure 4–2 Circuit monitor option slot locations

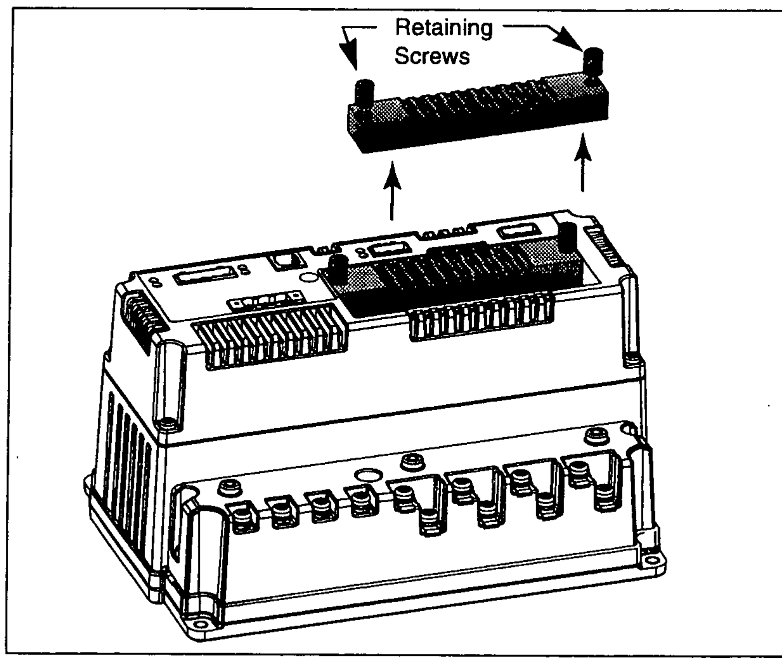

Figure 4–3 Removing the dust cover on the circuit monitor

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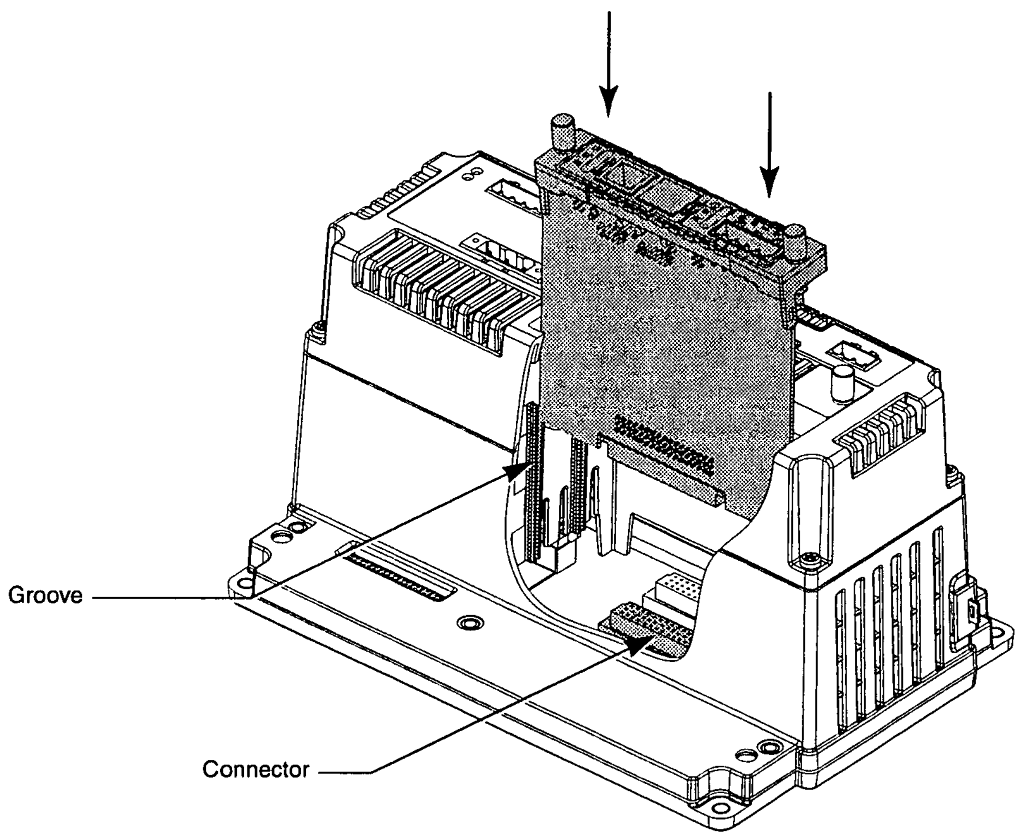
4. Orient the ECC and align with the grooves inside slot A as shown in Figure 4–4.
5. Slide the ECC down until it is firmly seated and the connectors on the card and the circuit monitor are engaged. The top of the card should be flush with the top of the circuit monitor.

   NOTE: The connector pins bend easily. Do not force the card into the slot.

6. Hand tighten the retaining screws to secure the ECC to the circuit monitor.



NOTE: Current/Voltage Module removed for illustration purposes.

Figure 4–4 Installing the ECC into the circuit monitor

7. If the host circuit monitor is mounted in an enclosure, make sure to remove all tools from the enclosure. Then install all covers and close all doors to the enclosure.
8. Proceed to the next section, "Wiring" on page 16, and make all wiring connections as described. Do not restore power until communications wiring is complete.

WIRING

This section describes ECC control power and communications wiring.

Control Power

The ECC does not have its own control power supply. The ECC receives control power from the circuit monitor into which it is installed. The green power LED illuminates steadily when power is being received from the CM4000.

Communications

This section describes communications wiring for the RS-485 serial and the Ethernet ports.

RS-485 Serial Port

The RS-485 serial port is used for communications with daisy-chained devices and is designed to support up to 31 defined devices without a repeater (Figure 4–5), or up to 63 defined RS-485 devices with a repeater. The RS-485 enables communications via a 4-wire plus shield cable (Tx+, Tx–, Rx+, Rx-, and Shld). It can also be configured for 2-wire plus shield.

REDACTED

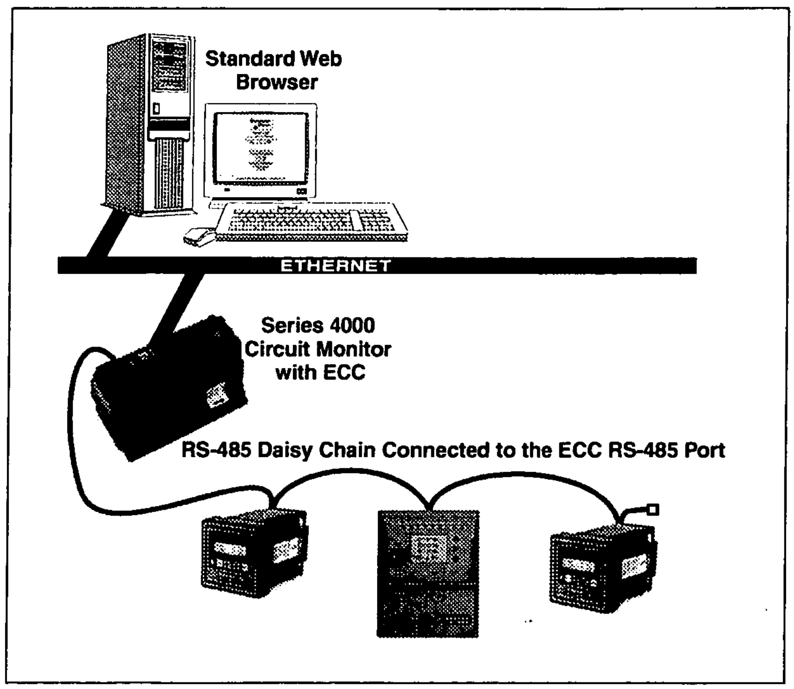


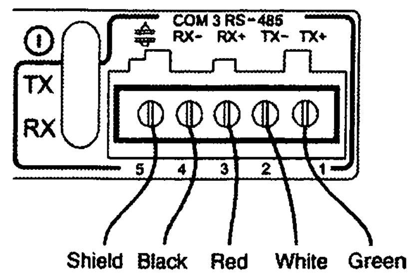
Figure 4–5 Daisy Chain connected to ECC RS-485 port

For 4-wire communication, Belden 8723 or 9842 cable or equivalent is recommended. For 2-wire communication, Belden 9841 or equivalent is recommended.[1]

1. If Enercept® meters are on the daisy chain, use Belden 1120A or equivalent.

REDACTED

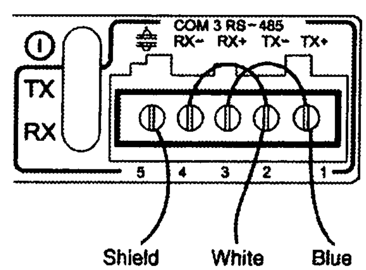
The connector used to wire into this interface is a 5-point screw type commonly known as a "phoenix" connector. For 4-wire communication, connect the wires to the terminal block as show in Figure 4–6.



NOTE: Wire colors shown are for Belden 8723 cable.

Figure 4–6 Communications wiring for 4-wire cable

For 2-wire communication, connect the white wire to the Tx– terminal and the blue wire to the Tx+ terminal as shown in Figure 4–7. Then connect a jumper wire from terminal Tx– to terminal Rx– and another jumper wire from terminal Tx+ to terminal Rx+. Connect the shield wire to the shield terminal.



NOTE: Wire colors shown are for Belden 9841 cable.

Figure 4–7 Communications wiring for 2-wire cable

RS-485 LEDs

One set of LEDs is provided for the RS-485 port: a yellow LED which illuminates when the ECC is receiving data (RX) and a green LED which illuminates when data is transmitted (TX).

NOTE: A third LED (green) next to the RS-485 RX and TX LEDs is the ECC power LED. It illuminates steadily when the ECC is receiving control power.

Biasing

On RS-485 daisy chains, correct biasing is required to ensure reliable communications. Traditionally, a Multipoint Communications Adapter (part number MCA-485) is used at the beginning of the daisy chain. However, no external MCA is necessary with the ECC because the adapter circuitry is built in.

Termination

RS-485 daisy chain termination is required to ensure reliable communications. The last device on the daisy chain usually needs to have a Multipoint Communications Terminator (part number MCT-485 or MCTAS-485). Refer to the instruction bulletin for the last device on the daisy chain to determine whether an MCT is required. If one is, contact your local sales representative.

Daisy Chain Maximum Distances

REDACTED

The maximum number of devices capable of being supported on a single daisy chain is determined based on the combination of baud rate, the length of the daisy chain, and the types of RS-485 devices (2-wire/4-wire) on the daisy chain. The RS-485 interface will support daisy chains that fall within the specifications shown in Tables 4–2 and 4–3.

Table 4–2: 4-Wire Daisy Chain Maximum Distances

Baud Rate	Maximum Distances	
	1–16 Devices	17–32 Devices
1200	10,000 ft. (3,048 m)	10,000 ft. (3,048 m)
2400	10,000 ft. (3,048 m)	5,000 ft. (1,524 m)
4800	10,000 ft. (3,048 m)	5,000 ft. (1,524 m)
9600	10,000 ft. (3,048 m)	4,000 ft. (1,219 m)
19200	5,000 ft. (1,524 m)	2,500 ft. (762 m)
38400	5,000 ft. (1,524 m)	1,500 ft. (457 m)

Table 4–3: 2-Wire Daisy Chain Maximum Distances

Baud Rate	Maximum Distances	
	1–8 Devices	9–16 Devices
1200	10,000 ft. (3,048 m)	10,000 ft. (3,048 m)
2400	10,000 ft. (3,048 m)	5,000 ft. (1,524 m)
4800	10,000 ft. (3,048 m)	5,000 ft. (1,524 m)
9600	10,000 ft. (3,048 m)	4,000 ft. (1,219 m)
19200	5,000 ft. (1,524 m)	2,500 ft. (762 m)
38400	2,500 ft. (762 m)	1,500 ft. (457 m)

Ethernet Ports

The ECC has two on-board Ethernet ports: 10/100BaseTX Twisted Pair and 100BaseFX. Figure 4–8 shows a typical network application.

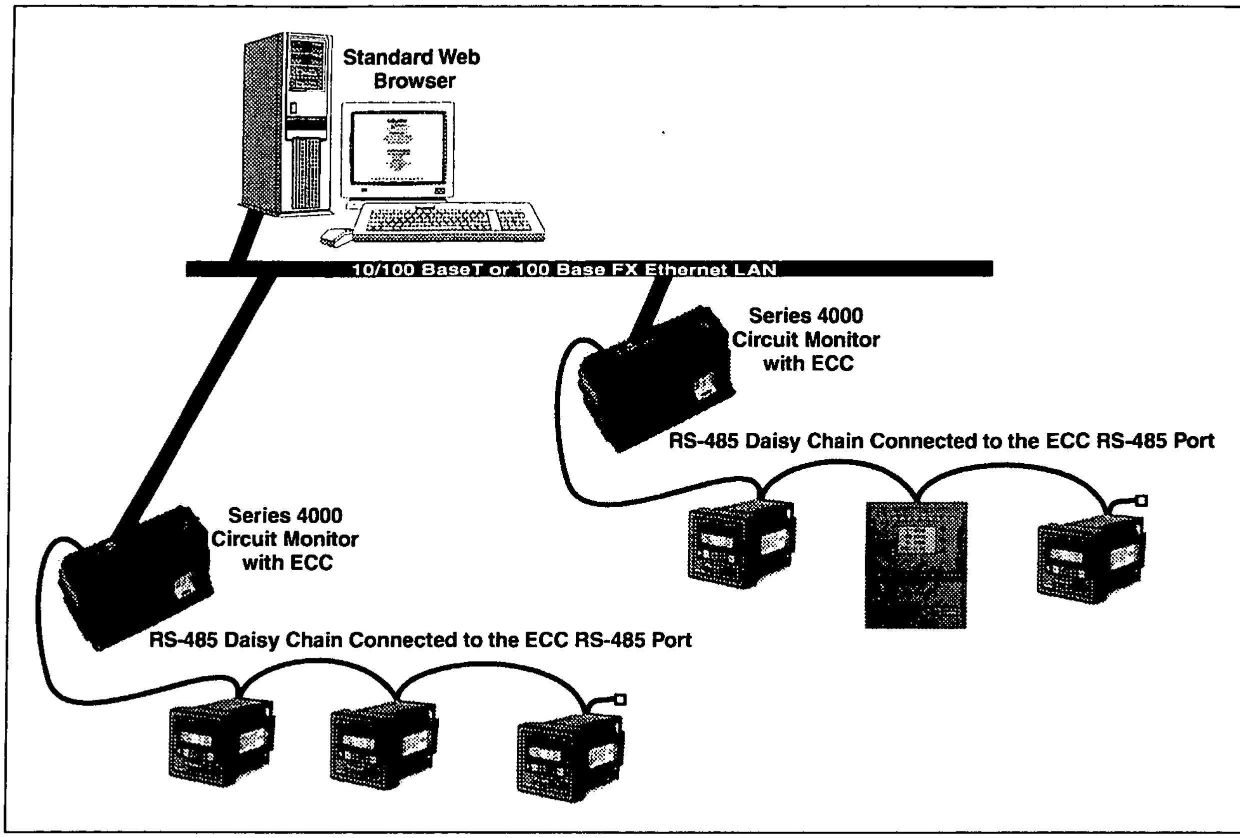


Figure 4–8 Series 4000 Circuit Monitor with ECC in typical network application

REDACTED

10/100BaseTX RJ-45 Twisted Pair

This Ethernet port drives a twisted pair cable up to 328 ft. (100 m). Use data grade twisted-pair wire. This wire *must* have a characteristic impedance of 100 ohms and meet the EIA/TIA Category 5 standard wiring specifications. The cable can be either Shielded Twisted Pair (STP) or Unshielded Twisted Pair (UTP). UTP is commonly used in the United States, and STP is commonly used in Europe.[1]

100BaseFX Fiber-Optic

The ECC on-board fiber-optic port allows the CM4000 to communicate with a fiber-optic based Ethernet LAN. The port is a duplex LC connector receptacle and is compatible with 1300 nm wavelength multimode fiber connections. It is optimized for 62.5 or 50/125 micron multimode graded index glass optical fiber. The transceiver is capable of signal integrity in up to 6,562 ft. (2,000 m) of multimode fiber. This port supports both half-duplex and full-duplex fiber-optic cable.

NOTE: The ECC is shipped with a dust cover inserted into the fiber-optic port because the port is very sensitive to dust. The dust cover should remain in the fiber-optic port at all times except when it is removed to insert a fiber-optic cable. Retain the dust cover for future use.

Ethernet LEDs

The two Ethernet ports share one set of LEDs: a yellow LED which illuminates when the ECC is receiving data (RX) and a green LED which illuminates when data is transmitted (TX). A third light, LK (Link), illuminates when there is a proper Ethernet connection.

NOTE: Only one Ethernet port can be used at a time.

RESTORING POWER

NOTE: If the host circuit monitor is mounted in an enclosure, make sure to remove all tools from the enclosure. Then install all covers and close all doors to the enclosure before restoring power.

REDACTED

Turn power back on in this order:

1. Un-short the CTs.
2. Put PT fuses back or turn on the disconnect switch.
3. Turn on control power to the circuit monitor.
4. If another option card is installed, restore power to it.

1. For CE applications, do not use IBM Type 1 Cabling (STP at 150 ohms).

CHAPTER 5—SETUP

CHAPTER CONTENTS

REDACTED

SETTING UP THE ECC VIA THE SERIES 4000 CIRCUIT MONITOR DISPLAY

Prior to setting up the ECC, obtain a unique IP address, subnet mask, router address, and the Ethernet physical connection (fiber or twisted pair) for the CM4000 from your network administrator. You will use this information to configure the ECC via the CM4000 local display.

Initial Local Setup

NOTE: For more information on Series 4000 Circuit Monitor display operation, refer to the POWERLOGIC Circuit Monitor Series 4000 *instruction bulletin.*

After installing the ECC in the CM4000, you are ready to set up the ECC via the CM4000 local display. Follow these steps:

REDACTED

1. From the CM4000 main menu, select Setup. The password prompt displays.
2. Select your password. The circuit monitor default password is 0. The Setup menu displays. Select Communications.

```
SETUP
   Display
→ Communications
   Meter
   Alarm
   I/O
   Passwords
```

3. The Communications setup screen displays. Select Ethernet Option.

```
Comms Setup----------
   RS-485
   RS-232
   Display IR
→ Ethernet Option
```

REDACTED

4. The Ethernet Setup screen displays.

```
Ethernet Setup----------
→ IP Address
               0.0.0.0
  Subnet Mask
       255.255.255.255
  Router
               0.0.0.0
  Port Type        UTP
```

Table 5–1 describes the options on this menu.

5. Use the arrow buttons to scroll to the menu option you want to change.
6. Press the enter button to select the value. The value begins to blink. Use the arrow buttons to scroll the available values. To select the new value, press the enter button.
7. Use the arrow buttons to scroll through the other options on the menu, or, if you are finished, back out of the menu and, when prompted to save, answer Yes.

Table 5–1: Ethernet Communication Setup Parameters[1]

Option	Available Values	Selection Description	Default
IP Address	0.0.0.0 to 255.255.255.255	The unique IP address of the ECC.	0.0.0.0
Subnet Mask[2]	0.0.0.0 to 255.255.255.255	The unique subnet mask of your network.	255.255.255.255
Router[2]	0.0.0.0 to 255.255.255.255	Designates the router used to communicate to other segments.	0.0.0.0
Port Type	UTP Fiber full duplex Fiber half duplex	UTP—10/100BaseTX communications Fiber—100Base FX fiber-optic communications	UTP

1. After the initial setup, the ECC is accessible via Ethernet and the remaining ECC setup can be done via HTML and a standard web browser.
2. Optional if communications are over an isolated network only.

NOTE: The ECC HTML pages are not *accessible via the circuit monitor local display. The following section tells how to set up and access these pages via a network.*

SETUP VIA A NETWORK OR THE INTERNET

This section tells how to configure the ECC over a network or the Internet. After you set up Ethernet parameters using the Series 4000 Circuit Monitor display, the ECC is accessible via Ethernet and standard web browsers such as Internet Explorer (version 5.0 or higher recommended). All ECC setup information is stored in the circuit monitor into which the ECC is inserted. Thus, one ECC can be exchanged with another ECC without affecting these settings.

Log Into the ECC

REDACTED

To log into the ECC via an Ethernet network, follow these steps:

Launch your Internet web browser (Internet Explorer v. 5.0 or higher is recommended).

Enter the ECC IP address (for example 221.234.252.39) into the URL address field (Figure 5–1) and press Enter.

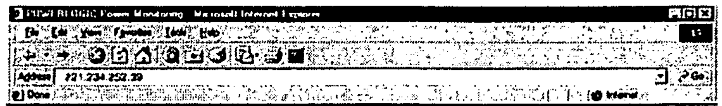


Figure 5–1 IP address entered in URL address field

NOTE: If this is the first time you have accessed the ECC via a web browser, the password log-in page displays. The default password is "admin", all lower case. If you are the administrator, it is highly recommended, for security reasons, that you change this default password at this time. See "Password Administration" on page 30 for more information. After you have logged in, you will have the option of bypassing the password login for some pages so you can bookmark an HTML page and go directly to it. See "Disabling Passwords" on page 30 for more information.

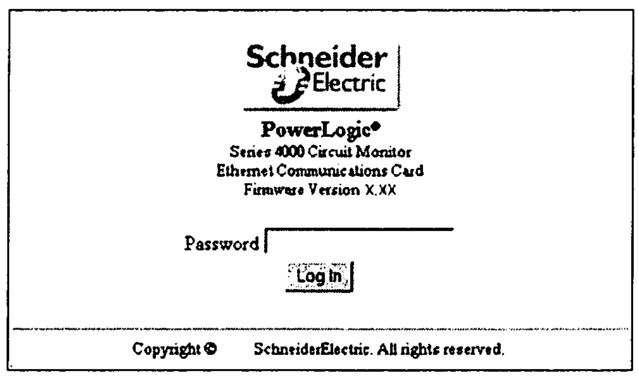


Figure 5–2 ECC Log In page

ECC Home Page

REDACTED

The ECC Home page displays (Figure 5–3). The list of available options on this page varies depending on the level of access assigned in the password administration option.

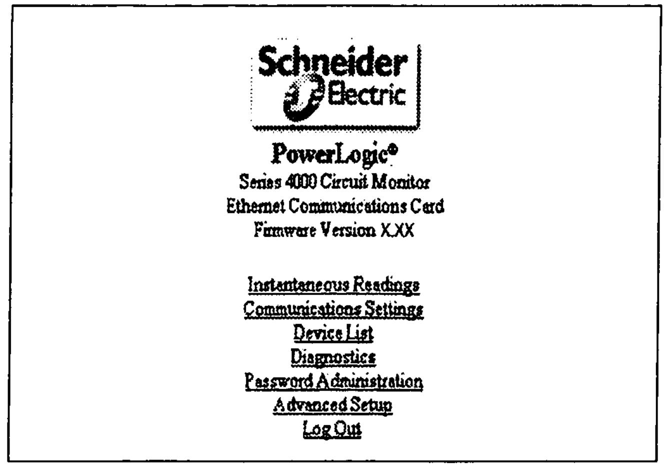


Figure 5–3 ECC Home page

Instantaneous Readings

No set up is required for the Instantaneous Readings page. For more information, see "Chapter 6—Real-Time Device Monitoring" on page 35.

Custom Pages

No set up is required for custom pages. For more information, see "Chapter 7—Transferring HTML Pages Via FTP" on page 43.

Accessible custom pages (those stored in the host circuit monitor memory) will be listed on the ECC Home page between Instantaneous Readings and Communications Settings.

Setup Options

The standard options shown on the ECC home page are summarized in Table 5–2. Following the table, each option is explained in more detail.

Table 5–2: ECC Setup Options

Option	Description	See Page
Communication Settings	Set up or modify Ethernet and serial communication parameters.	26
Device List	Identify serial devices on the daisy chain.	27
Diagnostics	Troubleshooting and miscellaneous ECC information.	29
Instantaneous Readings	Series 4000 Circuit Monitor real-time meter readings. *No set up is required.*	35
Password Administration	Set up and change user passwords and access levels.	30
Advanced Setup[1]	Change ECC timing values.	31
Log Out	Close ECC client session.	32
Custom Pages	Five default custom pages are embedded in the CM4000, with others available. These can be modified to fit your specific application.	43

1. Accessible by administrator only.

Communications Settings

Figure 5–4 shows the Communications Settings page. You will set up Ethernet and RS-485 ports here. After changing a value, you *must* click the update button for changes to take effect.

REDACTED

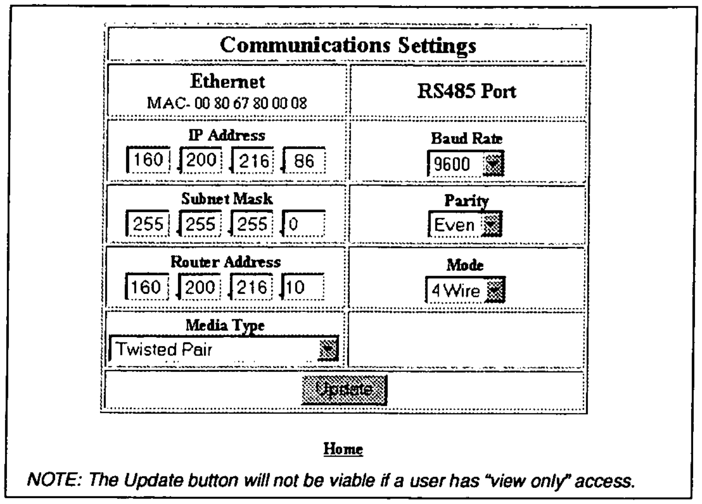


Figure 5–4 Communications Settings page

NOTE: If you change any Ethernet parameter on the Communications Settings page and click update, the ECC resets and the new settings immediately go into effect. Because of the reset, you will need to log in to the ECC again. To log in, type the IP address into the URL address field and press Enter.

Ethernet Port Setup Via LAN

After you assign the initial TCP/IP address to the ECC through the circuit monitor display, you can go to the Communications Settings HTML page via a standard web browser and change the ECC TCP/IP setup (Figure 5–4). The following parameters are necessary for TCP/IP setup and must match your network LAN:

- IP address
- subnet mask
- router address
- media type (twisted pair or fiber optic half- or full-duplex)

RS-485 Serial Port Setup

The RS-485 setup information consists of baud rate parity, and port mode (Table 5–3). The baud rate and parity you assign must match the settings for attached RS-485 devices (all devices must have the same baud rate and parity settings). Set the port mode according to whether your daisy chain is 2-wire or 4-wire.

Table 5–3: RS-485 Setup Parameters

Parameter	Options
Baud Rate	1200, 2400, 4800, 9600, 19200, 38400
Parity	None, Even
Mode	4-Wire; 2-Wire

Device List

REDACTED

Figure 5–5 shows the HTML Device List page.

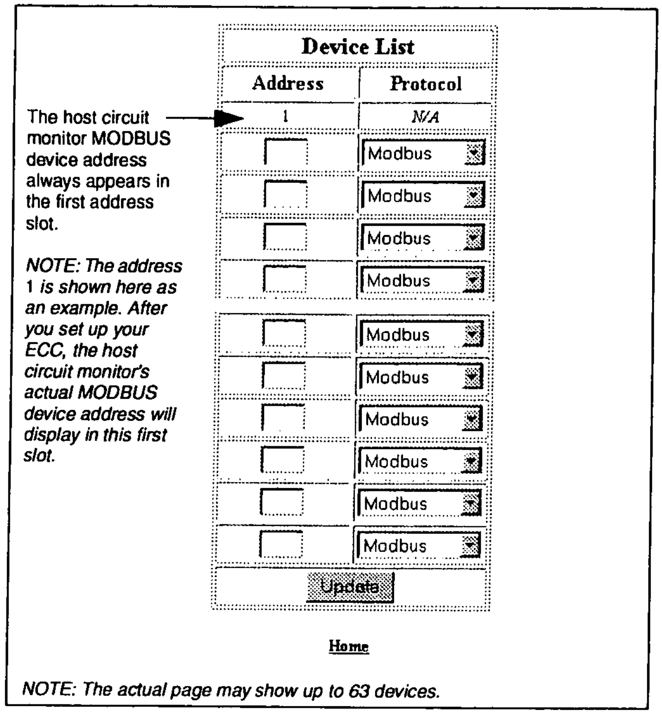


Figure 5–5 Device List page

Keep in mind the following points when setting up the Device List:

- MODBUS/JBUS devices do not have to be defined in the Device List.
- POWERLOGIC protocol (SY/MAX) devices must be defined in the Device List.
- Up to 31 devices can be defined on the Device List page without a repeater.
- To communicate with the host circuit monitor via MODBUS/TCP, use the circuit monitor MODBUS device address. This address will always be the first address listed on the Device List (in Figure 5–5, this address is 1).

REDACTED

Table 5–4 shows the address range available for various protocols.

Table 5–4: RS-485 Device Definitions Address Range

Protocol	Available Device Address Range
MODBUS, JBUS	1 through 247
POWERLOGIC	1 through 199

NOTES:

- ***Do not assign address 1 to any POWERLOGIC protocol device on a mixed-mode daisy chain.***
- ***Do not assign address 16 to any MODBUS or JBUS device if you have a mixed-mode daisy chain (for example a single daisy chain with some RS-485 devices using POWERLOGIC protocol and other devices using MODBUS/JBUS protocol).***

For information on adding additional address/protocol positions to the Device List, see “Advanced Setup” on page 31.

Diagnostics

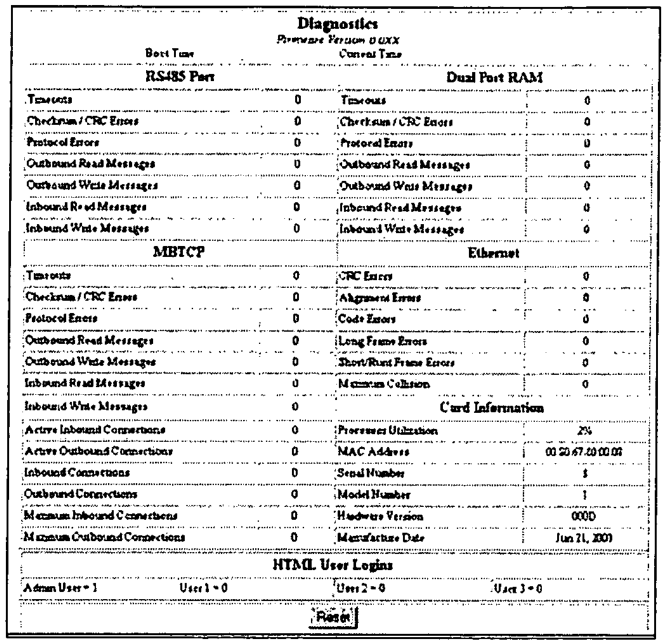
REDACTED

The ECC displays diagnostics data on this page. In addition to its information value, this page may be helpful in troubleshooting network problems. This page also contains information about your specific ECC, including the serial number, manufacturing date, and Media Access Control (MAC) address. Pressing Reset clears the accumulative readings counters.

NOTES:

- *This page shows accumulated readings since the ECC was last activated. If power to the ECC is lost, all values reset to zero. The reset button will not display if a user has "view only" access.*
- *The HTML User Logins since the ECC was last activated are shown at the bottom of the page.*

Figure 5–6 shows the Diagnostics page.



Diagnostics

Firmware Version 0.0XX

Boot Time Current Time

RS485 Port		Dual Port RAM	
Timeouts	0	Timeouts	0
Checksum / CRC Errors	0	Checksum / CRC Errors	0
Protocol Errors	0	Protocol Errors	0
Outbound Read Messages	0	Outbound Read Messages	0
Outbound Write Messages	0	Outbound Write Messages	0
Inbound Read Messages	0	Inbound Read Messages	0
Inbound Write Messages	0	Inbound Write Messages	0
MBTCP		**Ethernet**	
Timeouts	0	CRC Errors	0
Checksum / CRC Errors	0	Alignment Errors	0
Protocol Errors	0	Code Errors	0
Outbound Read Messages	0	Long Frame Errors	0
Outbound Write Messages	0	Short/Runt Frame Errors	0
Inbound Read Messages	0	Maximum Collision	0
Inbound Write Messages	0	**Card Information**	
Active Inbound Connections	0	Processor Utilization	2%
Active Outbound Connections	0	MAC Address	00 20 67 20 00 00
Inbound Connections	0	Serial Number	1
Outbound Connections	0	Model Number	1
Maximum Inbound Connections	0	Hardware Version	000D
Maximum Outbound Connections	0	Manufacture Date	Jun 21, 2001

HTML User Logins

Admin User = 1	User 1 = 0	User 2 = 0	User 3 = 0

Reset

Figure 5–6 Diagnostics page

Password Administration

Figure 5–7 shows the Password Administration HTML page. There are four password accounts on the page, one administrator account and three user password accounts. The default passwords assigned to user accounts are "master," "engineer," and "operator" (Figure 5–7). The default passwords are editable by the administrator.

Administrator Account

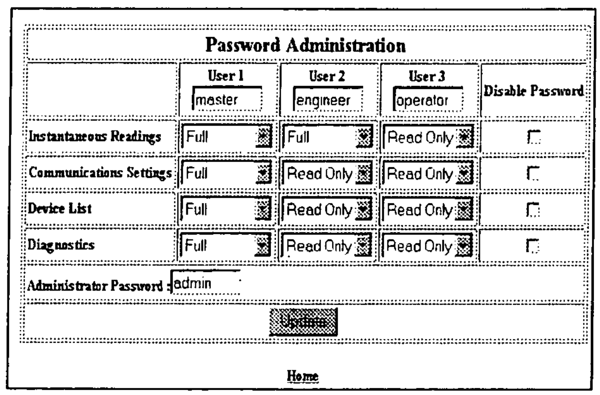
The administrator account is always granted full access to every HTML page available through the ECC. The administrator account password is configurable. Only the administrator can access and change passwords. The administrator password can be from one to eight alphanumeric characters and is case-sensitive. The default administrator password is "admin".

NOTE: If you are the administrator, it is highly recommended, for security reasons, that you change this default password the first time you log in.

User Account

The default access levels for all user accounts are shown in Figure 5–7. The administrator can grant one of three access levels for each HTML page to each user: None (no access), Read Only, and Full (access).

REDACTED


Password Administration

	User 1 master	User 2 engineer	User 3 operator	Disable Password
Instantaneous Readings	Full	Full	Read Only	
Communications Settings	Full	Read Only	Read Only	
Device List	Full	Read Only	Read Only	
Diagnostics	Full	Read Only	Read Only	

Administrator Password admin

Submit

Home

Figure 5–7 Password Administration page (default values shown)

Up to 10 concurrent users can be logged into the ECC at any given time, using any combination of passwords. The amount of time the ECC waits during an inactivity period before "expiring" access is configurable (see "Advanced Setup" on page 31). During normal operations, it is recommended that each user return to the ECC home page and select "log out" when finished interfacing with the ECC; doing so immediately releases that access privilege for another user.

Disabling Passwords

The administrator can disable the password for many HTML pages. This disables security for that page, allowing users to bookmark the page for quick access without receiving the password prompt. For information on bookmarking HTML pages, see "Bookmarking an HTML Page" on page 32.

Table 5–5 summarizes password accounts, default passwords, and access levels.

Table 5–5: Password Administration Summary

Password Account	Default Password	Convention[1]	Access
Administrator	admin	1-8 characters	Full access to all passwords and HTML pages
User 1	master	1-8 characters	Choosing from the following options, the administrator assigns access levels for these HTML pages: Instantaneous Readings, Communication Settings, Device List, Diagnostics, and Custom Pages. Access levels are: • None (no access) • Read Only • Full (full access; same as Administrator Access)
User 2	engineer	1-8 characters	
User 3	operator	1-8 characters	

1. Case-sensitive, alphanumeric characters only.

Advanced Setup

The Advanced Setup HTML page is accessible by the administrator password only. This setup page allows advanced users to tweak ECC timing values that normally should never be changed. ECC parameters and corresponding values are show in Table 5–6.

REDACTED

Table 5–6: Advanced Communication Setup Parameters

Parameter	Range of Values	Description
HTML User Timeout	1–255 minutes	Maximum time allowed for a user to stay idle before the ECC expires that user's access.
Timeout for RS-485 Port	3–10 seconds	Maximum time the ECC will wait for requested information from the RS-485 daisy-chained devices.
Instantaneous Readings Refresh Rate	5–300 seconds	Interval at which Instantaneous Readings page updates readings.
Timeout for Host Circuit Monitor	3–10 seconds	Maximum time the ECC will wait for requested information from the Series 4000 Circuit Monitor.
Number of Viewable Devices	2–64 devices	Number of viewable devices in the HTML Device List page.

REDACTED

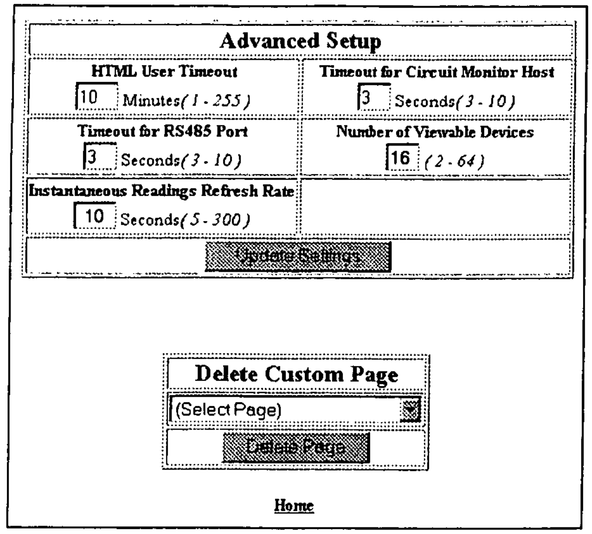


Figure 5–8 Advanced Setup page

As shown in Figure 5–8, you can also delete custom pages from the Advanced Setup page. To do so, select the page you want to delete and click Delete Page.

Log Out

To log out of the ECC HTML pages, go to the ECC Home page and click Log Out. This ends your client session. The Log In page displays so you will be able to quickly log back in when you are ready.

Bookmarking an HTML Page

To bookmark an HTML page, follow these steps:

1. Disable security for the page you want to bookmark by:
   a. logging in using the administrator password
   b. opening the Password Administration page and clicking the box in the Disable Password column for the HTML page you are going to bookmark
   c. clicking Update
2. Type the HTML page address in the address field of your web browser.

   Follow this convention: http://(IP address)/(name of page).htm

   For example, if you want to bookmark the Instantaneous Readings page, and the IP address of the ECC is 157.198.216.86 type:

   http://157.198.216.86/InstantaneousReadings.htm

REDACTED

Page names are case-sensitive. Capitalize only the first letter of each word; all other letters are lowercase. The correct HTML page naming convention for each HTML page is shown in Table 5–7.

NOTES:

- *You can not bookmark the Password Administrator or Advanced Setup pages.*
- *If you try to bookmark an HTML page using your web browser software, five access token numbers will be added to the URL after "htm". These five numbers must be removed to access the page.*

Table 5–7: Naming Conventions When Bookmarking HTML Pages

To Bookmark This Page:	Use this Naming Convention: (substitute your correct ECC IP Address for the one shown)
Instantaneous Readings	http://157.198.216.86/InstantaneousReadings.htm
Communications Settings	http://157.198.216.86/CommunicationsSetup.htm
Device List	http://157.198.216.86/DeviceList.htm
Diagnostics	http://157.198.216.86/Diagnostics.htm
Log Out	http://157.198.216.86/LogOut.htm
Custom Pages	http://157.198.216.86/CustomPageX[1].htm

1. Substitute the custom page number for "X".

REDACTED

CHAPTER 6—REAL-TIME DEVICE MONITORING

REDACTED

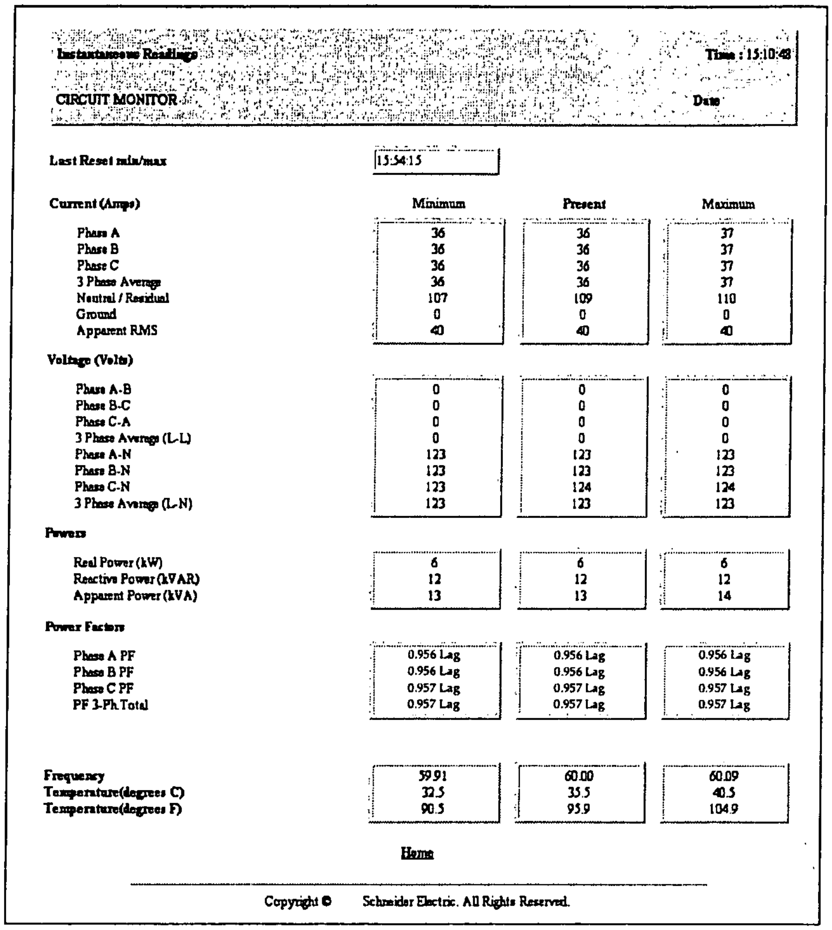
REDACTED

INTRODUCTION

The ECC has the capability to show real-time device data from a single device or multiple devices, including the host Series 4000 Circuit Monitor or any other attached devices.

INSTANTANEOUS READINGS (CM4000 HOST CIRCUIT MONITOR)

Included in the ECC pages is one non-customizable HTML page for viewing instantaneous readings from the host Series 4000 Circuit Monitor (Figure 6–1). This page is embedded into the ECC and is very similar to the System Manager Software (SMS) instantaneous page for the CM4000.


Instantaneous Readings
Time : 15:10:48
CIRCUIT MONITOR
Date

Last Reset min/max: 15:54:15

	Minimum	Present	Maximum
Current (Amps)			
Phase A	36	36	37
Phase B	36	36	37
Phase C	36	36	37
3 Phase Average	36	36	37
Neutral / Residual	107	109	110
Ground	0	0	0
Apparent RMS	40	40	40
Voltage (Volts)			
Phase A-B	0	0	0
Phase B-C	0	0	0
Phase C-A	0	0	0
3 Phase Average (L-L)	0	0	0
Phase A-N	123	123	123
Phase B-N	123	123	123
Phase C-N	123	124	124
3 Phase Average (L-N)	123	123	123
Powers			
Real Power (kW)	6	6	6
Reactive Power (kVAR)	12	12	12
Apparent Power (kVA)	13	13	14
Power Factors			
Phase A PF	0.956 Lag	0.956 Lag	0.956 Lag
Phase B PF	0.956 Lag	0.956 Lag	0.956 Lag
Phase C PF	0.957 Lag	0.957 Lag	0.957 Lag
PF 3-Ph Total	0.957 Lag	0.957 Lag	0.957 Lag
Frequency	59.91	60.00	60.09
Temperature(degrees C)	32.5	35.5	40.5
Temperature(degrees F)	90.5	95.9	104.9

Home

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Figure 6–1 Instantaneous Readings page

The metered values automatically update at the intervals you specify on the Advanced Setup page (see "Advanced Setup" on page 31.) For immediate updating of metered values, click Refresh on your browser.

HTML CUSTOM PAGES

Five custom HTML templates are stored in the CM4000 circuit monitor. As a backup, these pages are also stored on a diskette shipped with the ECC. The pages are configured to read data from the host CM4000. You can also configure them to provide a summary of a few or all of the devices on the daisy chain.

NOTE: A maximum of five custom HTML pages can be stored in the circuit monitor. If you need to delete a custom page from the circuit monitor to make room for another one, you can restore the deleted page in the future. To do so, load custom pages from the diskette you received with the ECC onto your computer hard drive and then upload them to the circuit monitor (where they are stored).

Custom pages can be uploaded from your computer hard drive to the host CM4000 (where they are stored) via File Transfer Protocol (FTP). For more information on custom HTML pages, see "Transferring HTML Pages Via FTP" on page 44.

NOTE: After custom pages are uploaded to your ECC, their names will appear on the ECC Home page between Instantaneous Readings and Communications Settings.

CREATING HTML CUSTOM DEVICE READINGS TABLES

You can create a new custom HTML page by modifying the code of an existing custom page.

NOTE: This section is intended for users already familiar with HTML and JavaScript. If you are not familiar with these topics, you can contract POWERLOGIC Power Management Engineering Services to modify HTML custom pages to fit your specific application. For more information, contact your local sales representative.

This section shows a sample custom device table and the code used to create it. The custom device tables are created by users very familiar with HTML and JavaScript. Each page is written in HTML with special delimiters that instruct the ECC to dynamically get register information from a device.

When creating custom HTML pages, remember that the maximum file size for each page is 20 KB or less. A maximum of five custom pages totalling 100 KB can be stored in the host circuit monitor at a time.

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The delimiters at the beginning (PL__) and end (__PL) of a string instruct the ECC to parse this string and dynamically fill it with register data. Table 6–1 shows supported POWERLOGIC tags and also, an HTML example of how they can be used.

Table 6–1: POWERLOGIC HTML Tags

Function Code	Function Name	POWERLOGIC Tag	Example of Data Returned
0	SY/MAX Block Read—Registers	<DeviceID>^<RegisterAddress>[<NumberOfRegisters>] example tag = PL__1^1003[5]__PL	85,86,84,25,56
4	SY/MAX Scattered Read—Registers	<DeviceID>^<RegisterAddress1>,<RegisterAddress2>,etc example tag = PL__1^1003,1004,1005,1006,1007	85,86,84,25,56
3	Modbus Block Read—Holding Registers	<DeviceID>^H<RegisterAddress>[<NumberOfRegisters>] example tag = PL__1^H1003[5]__PL	85,86,84,25,56
4	Modbus Block Read—Input Registers	<DeviceID>^I<RegisterAddress>[<NumberOfRegisters>] example tag = PL__1^I1003[5]__PL	85,86,84,25,56
100	Modbus Scattered Read—Holding Registers	<DeviceID>^S<RegisterAddress1>,<RegisterAddress2>,etc example tag = PL__1^S1003,1004,1005,1006,1007__PL	85,86,84,25,56

Example: An HTML Custom Page and Source Code

Figure 6–2 shows an example of a custom HTML page.

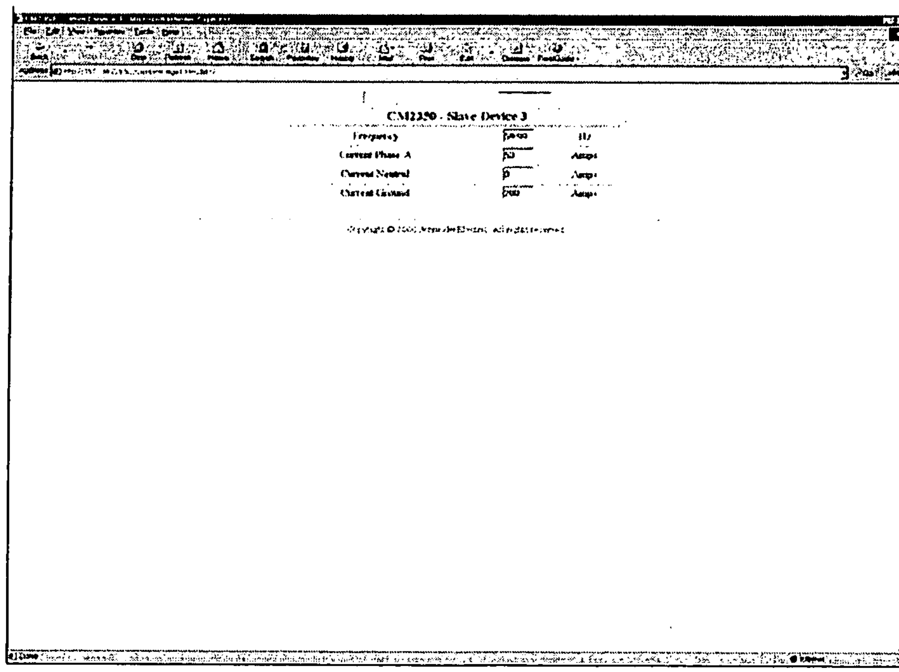

Figure 6–2 Example of a device HTML custom page

The source code used to develop the device HTML custom page in Figure 6–2 is shown below.

```
<html>

<head>
<META HTTP-EQUIV="refresh" CONTENT="5">
<title>CM2350 - Slave Device 3</title>
</head>

<body>
<form name="view_form">
  <p align="center">
        <input type = "text" name = "time_spot" size = "40">
        <table border="1" width="600">
    <tr>
      <td width="600"><p align="center"><font size="4"><b>CM2350 - Slave
       Device 3</b></font></p>
      </td>
    </tr>
  </table>
  <table border="1" width="600">
    <tr>
      <td width="300">
        <p align="center">Frequency</p>
      </td>
      <td align="center" width="90"><p align="center"><input
      type="text" size="5" name="frequency"></p>
      <td width="100">
        <p align="center">Hz</p>
      </td>
    </tr>
    <tr>
      <td width="300">
        <p align="center">Current Phase A</p>
      </td>
      <td align="center" width="90"><p align="center"><input
      type="text" size="5" name="currentphasea"></p>
      <td width="100">
        <p align="center">Amps</p>
      </td>
    </tr>
    <tr>
      <td width="300">
        <p align="center">Current Neutral</p>
      </td>
      <td align="center" width="90"><p align="center"><input
            type="text" size="5" name="currentneutral"></p>
      <td width="100">
        <p align="center">Amps</p>
              </td>
    </tr>
    <tr>
      <td width="300">
        <p align="center">Current Ground</p>
      </td>
      <td align="center" width="90"><p align="center"><input
```

REDACTED

```
            type="text" size="5" name="currentground"></p>
          <td width="100">
            <p align="center">Amps</p>
          </td>
        </tr>
      </table>
<br><HR SIZE="1" width="66%"><CENTER><font face="Times Roman"
size="2">Copyright © 2000 SchneiderElectric. All rights reserved.</font></CENTER>
</form>

<script language="JavaScript">
function ShowFreq()
{
  Registers = [PL__3^2020,2021,2022,2025,1001,1003,1006,1007__PL];
  ScaleFactorA = Registers[0];
  ScaleFactorB = Registers[1];
  ScaleFactorC = Registers[2];
  ScaleFactorF = Registers[3];
  Frequency = Registers[4];
  CurrentPhaseA = Registers[5];
  CurrentNeutral = Registers[6];
  CurrentGround = Registers[7];
  ScaleFactorAMultiplier = 0;
  ScaleFactorBMultiplier = 0;
  ScaleFactorCMultiplier = 0;
  ScaleFactorFMultiplier = 0;
  TheTime = new Date();

  switch (ScaleFactorA)
  {
    case -2:
      ScaleFactorAMultiplier = 0.01;
      break;
    case -1:
      ScaleFactorAMultiplier = 0.1;
      break;
    case 1:
      ScaleFactorAMultiplier = 10;
      break;
    default:
      ScaleFactorAMultiplier = 1;
      break;
  }
  switch (ScaleFactorB)
  {
    case -2:
      ScaleFactorBMultiplier = 0.01;
      break;
    case -1:
      ScaleFactorBMultiplier = 0.1;
      break;
    case 1:
      ScaleFactorBMultiplier = 10;
      break;
    default:
      ScaleFactorBMultiplier = 1;
      break;
```

NOTE: This is the POWERLOGIC tag.

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```
    }
    switch (ScaleFactorC)
    {
       case -2:
          ScaleFactorCMultiplier = 0.01;
          break;
       case -1:
          ScaleFactorCMultiplier = 0.1;
          break;
       case 1:
          ScaleFactorCMultiplier = 10;
          break;
       default:
          ScaleFactorCMultiplier = 1;
          break;
    }
    switch (ScaleFactorF)
    {
       case -1:
          ScaleFactorFMultiplier = 0.1;
          break;
       default:
          ScaleFactorFMultiplier = 0.01;
          break;
    }
    Frequency *= ScaleFactorFMultiplier;
    CurrentPhaseA *= ScaleFactorAMultiplier;
    if (CurrentNeutral == -32768)
       CurrentNeutral = "N/A";
    else
       CurrentNeutral *= ScaleFactorBMultiplier;
    if (CurrentGround == -32768)
       CurrentGround = "N/A";
    else
       CurrentGround *= ScaleFactorCMultiplier;
    document.view_form.frequency.value = Frequency;
    document.view_form.currentphasea.value = CurrentPhaseA;
    document.view_form.currentneutral.value = CurrentNeutral;
    document.view_form.currentground.value = CurrentGround;
    document.view_form.time_spot.value = TheTime;
}
ShowFreq();
</script>

</body>

</html>
```

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CHAPTER 7—TRANSFERRING HTML PAGES VIA FTP

CHAPTER CONTENTS

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OVERVIEW

The ECC can act as a File Transfer Protocol (FTP) server, providing a quick and easy way to download ECC firmware updates and upload HTML custom pages.

TRANSFERRING HTML PAGES VIA FTP

Five default ECC custom pages are already embedded in the Series 4000 Circuit Monitor. As a backup, those custom pages are also provided on a diskette shipped with your ECC. If you delete one or more custom pages embedded in the circuit monitor, and later want to replace the page(s), you can load the diskette files onto your computer hard drive and then upload them to the circuit monitor via FTP.

To modify the five ECC custom page templates to meet your specific applications, see “Creating HTML Custom Device Readings Tables” on page 37.

Newly created custom HTML pages will have to be uploaded to the circuit monitor via FTP.

To upload custom HTML pages into the circuit monitor via FTP, follow these steps:

NOTE: Before proceeding, we will assume you have created a folder on your computer hard drive in which to store custom HTML pages you wish to upload into the circuit monitor via FTP. In this example, we will use the folder “ecc” located on the C: drive.

1. Access DOS on your computer by selecting Start>Program>Command Prompt.
2. Type the drive you want to access (in this case **C:**) and press Enter (return).
3. Type **cd** (change directory) and the name of the folder containing the HTML pages you are going to FTP (in this example, **ecc**) and press Enter. (See Figure 7–1.)

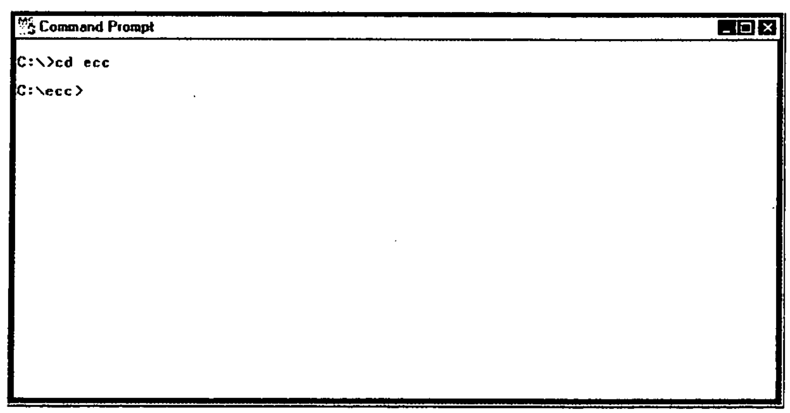

Figure 7–1 Identifying folder where HTML pages are stored

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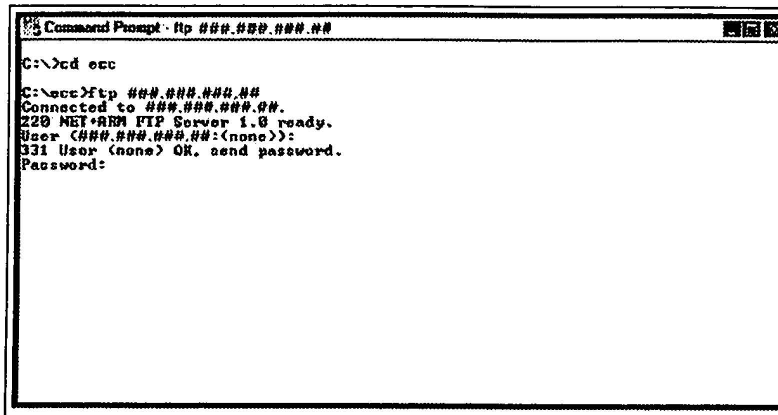
4. Type **ftp** and the **IP address** assigned to the ECC; click enter. You should receive the message "connected to [IP address]", indicating you are now in an FTP session.
5. At the "User (IP address:(none):" prompt, press Enter.
6. At the password prompt (Figure 7–2), enter the administrator password (**admin** is the default password until the administrator changes it).

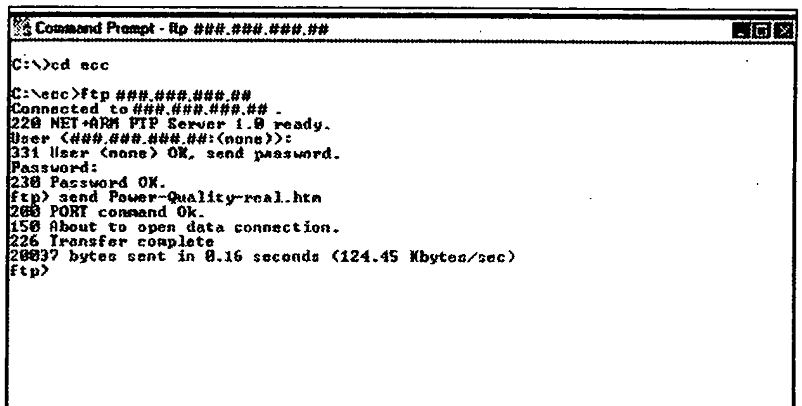


NOTE: The IP address you use will display in place of ###.###.###.##

Figure 7–2 Password prompt

7. At the ftp prompt, type **send [filename]** and press Enter to initiate the ftp transfer. (In this example, we entered "send Power-Quality-real").

   NOTE: The filename you enter is case-sensitive.
8. When the upload is complete (Figure 7–3), you will see the "ftp" prompt again. If you have another HTML page to upload, type **send [filename]** and press Enter. If you are finished uploading files, type **quit** and press Enter to exit the FTP session.



NOTE: The IP address you use will display in place of ###.###.###.##

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Figure 7–3 File transfer completed

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APPENDIX A—SYSTEM MANAGER SOFTWARE INTERFACE WITH THE ECC

CHAPTER CONTENTS

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OVERVIEW/REQUIREMENTS

This appendix provides instructions on setting up a PC interface with the ECC. You must be running System Manager Software (SMS) version 3.2 or higher.

COMMUNICATING WITH SYSTEM MANAGER SOFTWARE (SMS) VIA THE ECC

The first requirement in establishing communications with SMS is adding a Communications Connection by defining the name and interface type of the port.

Follow these steps to add the Communications Connection (PC interface):

1. Open the appropriate system (click Open > system > "system name"), or create a new system. (See the SMS instruction bulletin or help system for information on creating a new system.)
2. On the SMS main menu, select Setup > Communications Connection.
3. In the Setup Communications Connection dialog box click Add. SMS displays the Add Communications Connection dialog box (Figure A–1).

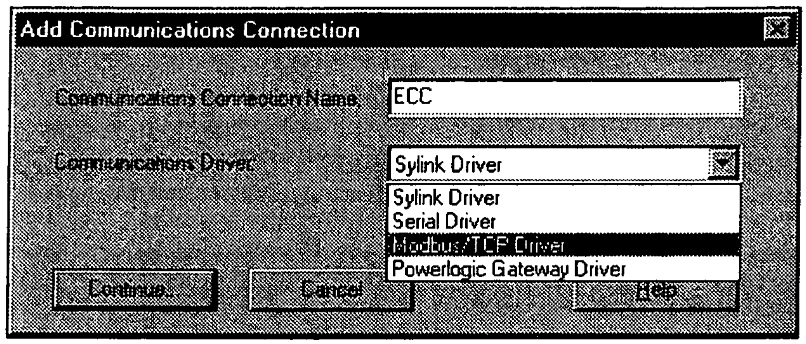

Figure A–1 Select MODBUS/TCP Driver in the Add Communications Connection dialog box

4. Type a unique name for the communication connection, up to 31 characters.
5. Select MODBUS/TCP Driver from the Communications Driver pull-down box.
6. Click Continue to proceed with setup.

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7. The Communications Connection—Modbus/TCP dialog box displays (Figure A–2).

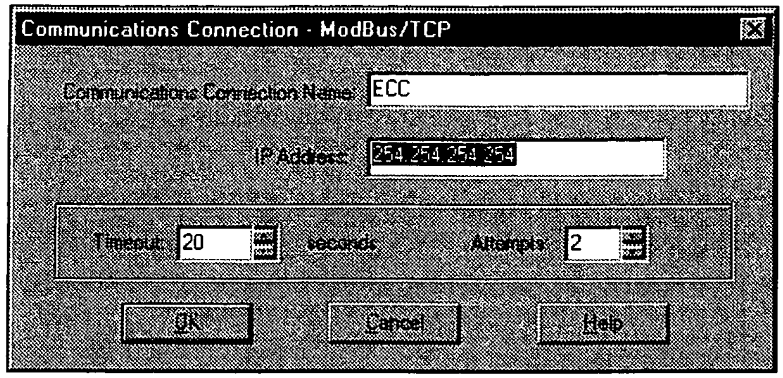

Figure A–2 Communications Connection MODBUS/TCP dialog box

8. The Communications Connection Name assigned in the previous dialog box displays (ECC in this example). Type the IP address assigned to the ECC. Click OK.

   The communication connection is now defined (Figure A–3)

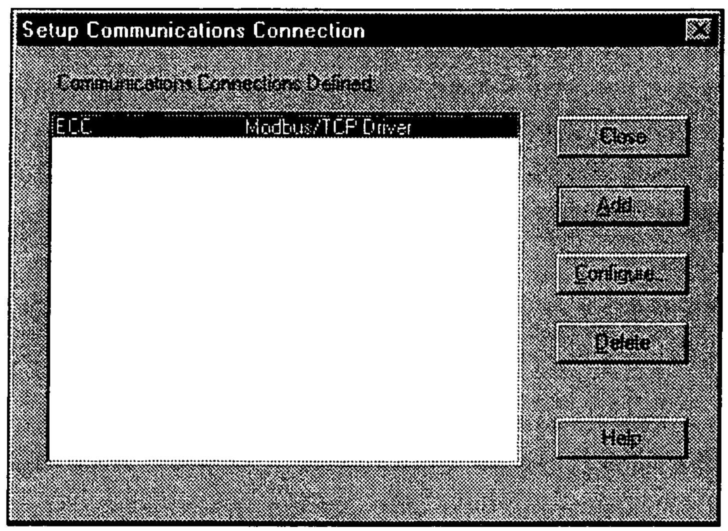

Figure A–3 Setup Communications Connection dialog box

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Adding Devices

To add devices to the SMS network server database, follow these steps:

1. On the Setup menu, click Devices/Routing... to display the Setup Devices/Routing dialog box (Figure A–4). This dialog box also lists all previously defined devices along with their device types and routes.

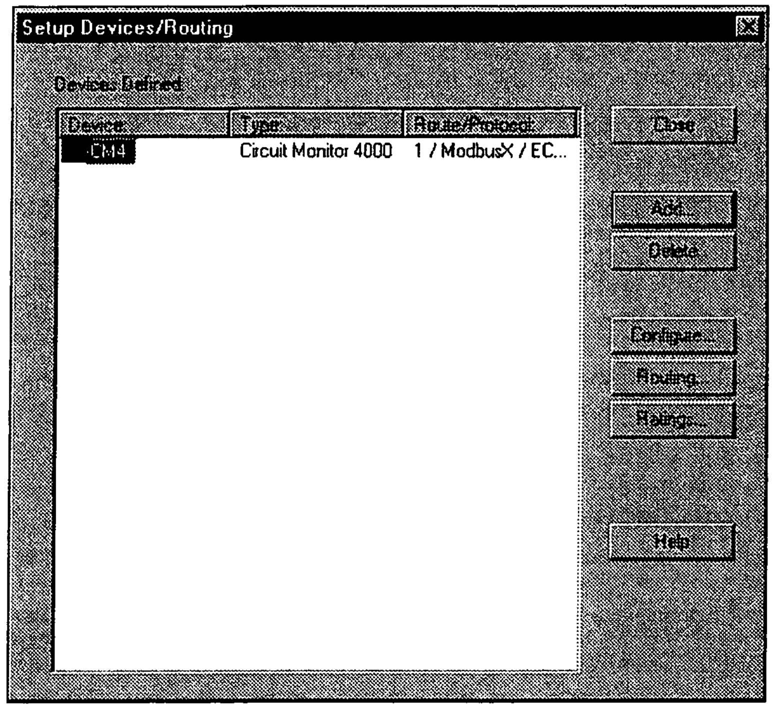

Figure A–4 Setup Devices/Routing dialog box

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2. Click Add to display the Add Device dialog box. Enter information as follows:
   - Device Name: Type a descriptive name for this device (32 characters maximum, no apostrophes), for example, *Main1 (Cube 1-A) CM4000.*
   - Device Type: Select the type of device you are adding.
   - Connection Name: Select the PC interface to which this device is connected.

NOTE: The Device Name and Connection Name you enter in this dialog box should match the names you have already assigned to the ECC and host circuit monitor.

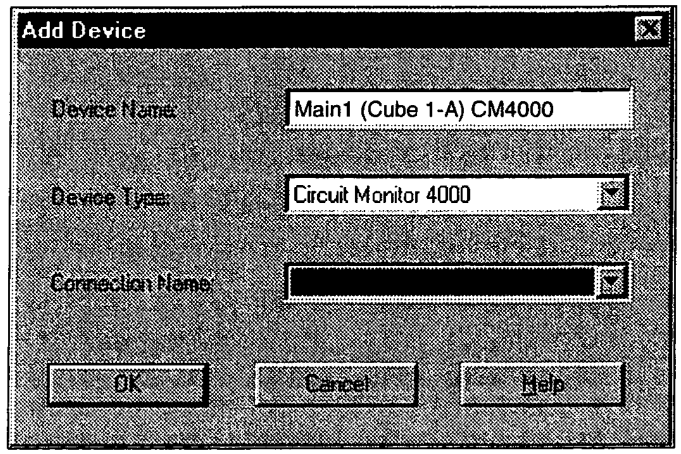

Figure A–5 Add Device dialog box

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3. Click OK and the MODBUS/TCP Device Route dialog box displays (Figure A–6). Enter information as follows:
   - — In the Comm Connection Name box, select the PC port to which this device connects. SMS defaults to the connection name chosen in the Add Device dialog box (figure 6-3).
   - — In the Device Address box, select the device address entered for this particular device.
   - — Select the protocol by which the device is to communicate:
     - POWERLOGIC—Choose this for any POWERLOGIC device not configured for MODBUS or JBUS.
     - MODBUS with POWERLOGIC Extensions or JBUS with POWERLOGIC Extensions—Choose this for a POWERLOGIC device configured to use MODBUS or JBUS.
     - MODBUS or JBUS—Choose this for any other MODBUS or JBUS device, or for a generic MODBUS/JBUS device type.

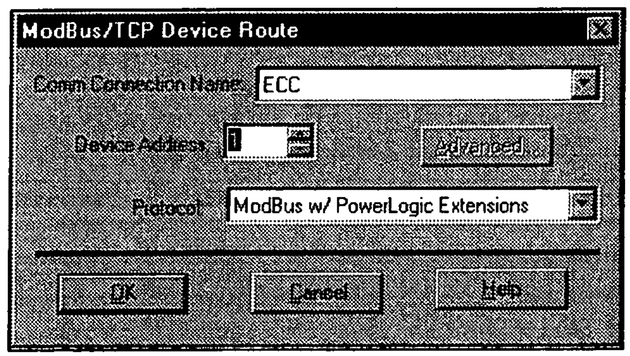

Figure A–6 MODBUS/TCP Device Route dialog box

4. Click OK.
5. Repeat steps 1–4 for each additional device you add to the system or the RS-485 daisy chain.
6. Close the MODBUS/TCP Device Route dialog box.

SMS is now configured to go online with the system just created.

For more information about SMS, refer to the SMS instruction bulletins.

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APPENDIX B—MAINTENANCE AND TROUBLESHOOTING

MAINTENANCE

The ECC does not require maintenance, nor does it contain any user-serviceable parts. If the ECC requires service, contact your local sales representative, or call the POWERLOGIC Technical Support Center for assistance.

Refer to the Technical Support Contacts provided in the Series 4000 Circuit Monitor shipping carton for a list of support phone numbers by country.

Firmware Updates

Due to technological improvements, the base firmware your ECC was shipped with may be updated periodically. We recommend periodically checking with your local sales representative to see if an upgrade is available.

If an update becomes available, compare the version number with the version number shown on the ECC home page. If the update is a newer version (has a higher version number), transfer it to your computer hard drive, taking note of which folder you store it in.

Then use FTP to transfer the firmware upgrade into the ECC. To do so, follow the steps listed in "Transferring HTML Pages Via FTP" on page 44. The process is identical except that you will be sending the firmware.bin file instead of an HTML file (Figure B–1).

```
Command Prompt - ftp ###.###.###.##

C:\>md ecc

C:\>cd ecc

C:\ecc>ftp ###.###.###.##
Connected to ###.###.###.##.
220 NET+ARM FTP Server 1.0 ready.
User (###.###.###.##:(none)):
331 User (none) OK, send password.
Password:
230 Password OK.
ftp> send firmware.bin_
```

NOTE: The IP address you use will display in place of ###.###.###.##

Figure B–1 Sending a firmware upgrade to the ECC via FTP

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TROUBLESHOOTING

Potential problems and their possible causes are shown in Table B–1.

Table B–1: Troubleshooting

Problem	Possible Cause	Solution
Power light is not illuminated.	1. Source power is not applied or is not stable. 2. External fuse is blown or not making good contact. 3. LED is burned out.	1. Apply power or check power source. 2. Check fuse. 3. Check to see if other LEDs operate properly. If they do, contact Technical Support.
RS-485 port LEDs repeatedly blink then pause.	ECC does not have a valid IP address or subnet mask.	Get valid IP address and subnet mask from network administrator. Then configure the ECC via the circuit monitor display.
Ethernet link light not lit.	Proper link is not established.	Make sure the proper cable is used and that it is properly connected. Reset the ECC.
SMS does not connect to the ECC.	1. Incorrect IP address. 2. Incorrect subnet mask or IP router address. 3. Bad Ethernet connection (look at Ethernet receive light, which indicates traffic on network).	1. Get correct IP address. 2. Get correct subnet mask and/or IP router address. 3. Check cable connections.
SMS does not go online with devices on ECC.	ECC not functioning correctly or configuration problems.	Check status LED. Verify that the ECC communication configuration matches the SMS configuration (IP mask and IP router are identical). Verify ECC receives requests (ping ECC, if using TCP/IP, by going to c:/prompt and typing ping and ECC IP address, e.g., **ping 199.0.62.41**). Your network administrator can help with this. Verify that the device address is entered correctly in SMS.
RS-485 port LED repeatedly blinks 8 times.	Incorrect Series 4000 Circuit Monitor firmware.	Call Technical Support for assistance.
Forgot administrator password.	—	Call Technical Support for assistance.

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APPENDIX C—SPECIFICATIONS

This appendix contains specifications for the ECC.

Table C–1: Specifications

ENVIRONMENTAL	
Ambient Operating Temperature	–25° to +70°C
Ambient Storage Temperature	–40° to +85°C
Relative Humidity Rating (Non-condensing)	5 to 95%
Altitude (maximum)	10,000 ft. (3,167 m)
Pollution Degree	2
REGULATORY/STANDARDS	
Electromagnetic Interference (Emissions)	Radiated: FCC Part 15 Class A/CE Heavy Industrial (EN55022)
	Conducted: FCC Part 15 Class A/CE Heavy Industrial (EN55022)
Electrostatic Discharge	Air Discharge: IEC 1000-4-2 (EN61000-4-2)
Immunity to Electrical Fast Transients	Transients: IEC 1000-4-4 (EN61000-4-4)
Immunity to Electromagnetic Fields	Radiated: IEC 1000-4-3 (EN61000-4-3)
	Conducted: IEC 1000-4-6 (EN61000-4-6)
Safety	USA: UL 508 Compliant
Listings	UL, CE, cUL

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Figure C–1 shows dimensions of the ECC.

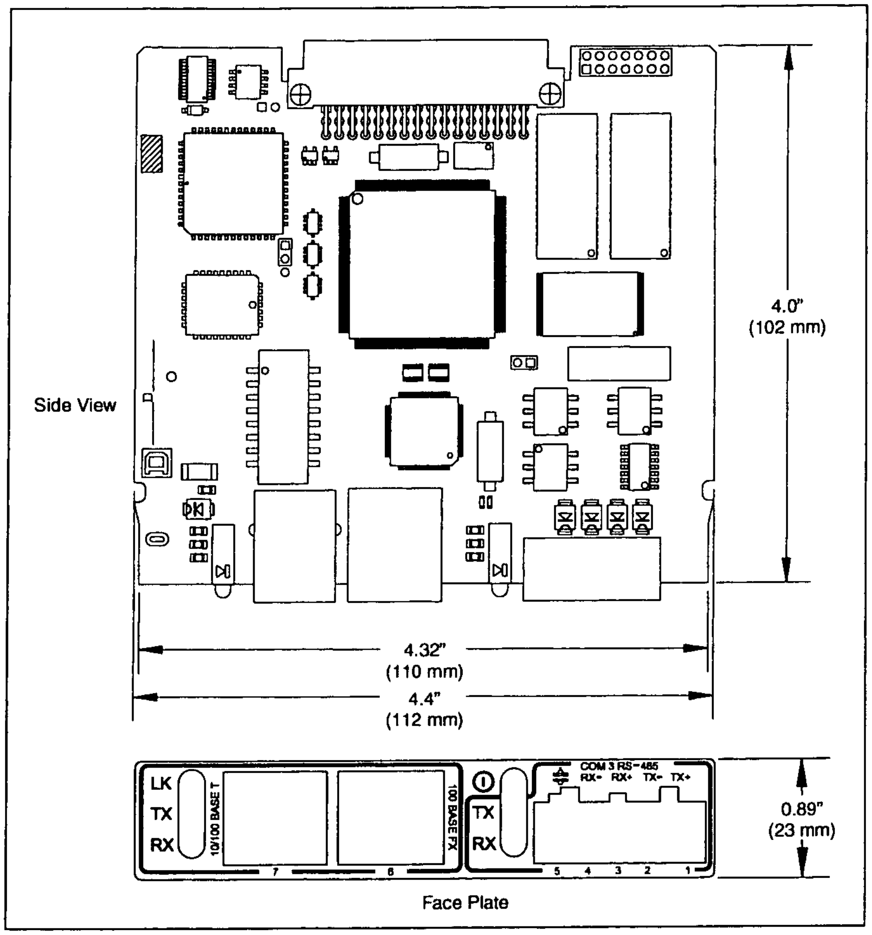

Figure C–1 ECC dimensions

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INDEX

REDACTED

REDACTED

REDACTED

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application No.	:	09/824,493
Filed	:	April 02, 2001
TC/A.U.	:	2157
Examiner	:	Lashonda T. Jacobs
Docket No.	:	47181-00244USPT
Customer No.	:	30223

CERTIFICATE OF MAILING

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail, postage prepaid, in an envelope addressed to the Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450, on October 4, 2006.

Signature: Carla Rivera

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

SUPPLEMENTAL 37 C.F.R. § 1.131 DECLARATION

Dear Sir:

We, Timothy G. Curray and Bradley A. Lazenby, named co-inventors of pending U.S. Patent Application No. 09/824,493 ("the '493 application"), entitled "Ethernet Communications For Power Monitoring System," supplementing our "37 C.F.R. § 1.131 DECLARATION" filed April 25, 2006, hereby declare:

1. The subject matter claimed in all the pending claims 1-41 in the '493 application was actually reduced to practice prior to November 28, 2000. The hardware that was reduced to practice is the Ethernet Communication Card, or "ECC," shown in the photograph on the first page of Exhibit B (submitted with our Declaration filed April 25). The ECC is shown in that photograph partially inserted into a Power Logic Series 4000 Circuit Monitor.

2. Attached as Exhibit C is a Schneider Electric/Square D news release dated July 20, 2000, announcing that the ECC is "Now Available" (i.e., as of July 20, 2000). This news release specifically mentions that the ECC allowed customers "to connect their POWERLOGIC CM4000 Circuit Monitor to their LAN/WAN system for direct Ethernet communications," that "An RS-485 Modbus master port on the ECC supports a daisy-chain of up to 31 additional devices, allowing the CM4000 with ECC to act as an Ethernet gateway for the devices," and that

"Embedded HTML pages allow for easy device setup and supply real-time power system information from the CM4000 circuit monitor through a standard web browser. Similar information can also be viewed for devices daisy-chained to the ECC's onboard RS-485 port."

3. Attached as Exhibit D is a Schneider Electric/Square D Sales Bulletin dated August, 2000, entitled "POWERLOGIC Ethernet Communication Card." This bulletin specifically describes the ECC as having the following features and functions:

POWERLOGIC Ethernet Communication Card Features

- Provides direct Ethernet TCP/IP communication for the POWERLOGIC Series 4000 circuit monitor
- Utilize existing Ethernet LAN/WAN
- View data and information through embedded HTML pages on a standard web browser
- Embedded HTML pages for setup and configuration
- 10/100 BaseT and 100 BaseFX ports
- Supports Modbus/TCP
- RS485 port supports up to 31 devices over a mixed mode daisy chain, i.e., SY/MAX, Modbus, and Jbus
- Mounts directly into expansion slot on Series 4000 circuit monitor
- Downloadable firmware via Internet

Direct Connection to Ethernet

The Ethernet Communication Card (ECC) provides Series 4000 Circuit Monitors direct high speed Ethernet connection to TCP/IP-based LAN/WAN networks. The ECC uses standard UTP RJ-45 and fiber optic LC connectors on the same board for flexibility in network cabling. Modbus/TCP protocol allows you a wider range of connectivity to include more products and gives network architecture more flexibility. Communicating at 10/100 megabaud speeds, the Series 4000 Circuit Monitor with the ECC puts fast access to information at your fingertips.

East Installation, Setup, and Data Viewing

The ECC easily installs into an expansion slot on the circuit monitor and connects by either UTP or fiber. A standard web browser gives access to embedded HTML pages that guide you through the setup and configuration process with ease. The power of the circuit monitor is now at your service with browser access to web

pages displaying real-time data. Five embedded HTML pages are customizable to meet your needs and can be created on a desktop PC then uploaded over the Ethernet through the ECC.

Information is also available from devices daisy-chained to the onboard RS-485 port. The port supports mixed mode communications including SY/MAX, MODBUS, and JBUS protocols. Up to 31 defined devices can be supported, 64 with a repeater.

Ethernet-based POWERLOGIC Power Monitoring Systems

The POWERLOGIC Power Monitoring and Control System with the Series 4000 Circuit Monitor and ECC allows you to leverage your existing Ethernet technology to satisfy your power monitoring and control system needs. Access to power and energy data, power quality, and other information is now available over virtually any existing communication infrastructure, including the Internet.

The combination of the Series 4000 Circuit Monitor and ECC provides greater expansion and flexibility in existing monitoring and control systems. As your POWERLOGIC system expands (the number of users increase, and additional devices are installed), you will be able to use standard off-the-shelf products to meet your specific network requirements.

4. ECC's were sold and shipped to several customers in August, September and October of 2000, and those ECC's included all the features and functionality described in paragraphs 2 and 3 of our Declaration filed April 25, 2006. Two such sales are confirmed by Exhibits E and F, which are copies of Square D Order Data Reports showing that ECC's were sold and shipped to Southern California Edison in Westminster, California on August 17, 2000, and to Fermilab in Batavia, Illinois on September 5, 2000. More than 100 ECC's were shipped to various customers in the United States before November of 2000.

5. One example of an ECC that was manufactured in September of 2000 is shown in the photographs in Exhibit G. The label affixed to this ECC, visible in the upper right-hand corner of the first photograph in Exhibit G, shows that this ECC was made on September 11, 2000, and was assigned Serial No. 13000060. The optical fiber port is covered by the cream-colored cap protruding from the top edge of the card in the first photograph.

6. Square D would not have sold and shipped the ECC, particularly in such quantities, without having thoroughly tested the design of the final product to ensure that it would perform the functions described in the sales literature and news releases (e.g., Exhibit C) and in the Instruction Bulletin that accompanied each product (see, e.g., the Instruction Bulletin

submitted as Exhibit B to our Declaration filed April 25). We were personally involved in such testing throughout the first eight months of 2000. Many of the tests to which the ECC was subjected prior to the first sales in August of 2000 are described in paragraphs 2 and 3 of our Declaration filed April 25. Those tests were carried out using test protocols established within Square D and described in an "ECC Test" document attached hereto as Exhibit H.

7. Prior to August of 2000, the ECC produced satisfactory results in each of the tests identified in Exhibit H. Those test results demonstrated that the ECC performed all the functions described in paragraphs 2 and 3 of our Declaration filed April 25. The ECC's that were tested at that time contained all the components and features identified in the bullet points listed in paragraphs 2 and 3 of our Declaration filed April 25, and were tested in a Square D Power Logic Series 4000 Circuit Monitor (referred to in Exhibit H as "CM4") to communicate with, and gather data in real time from, daisy-chained slave devices such as Square D's Series 2000 and Series 4000 Circuit Monitors (referred to in Exhibit H as "CM2s" and "CM4s") and Power Meters (referred to in Exhibit H as "PMs"). Custom HTML pages stored in the CM4 were accessed through the ECC using a standard web browser in a PC, to display information from both the CM4 and the daisy-chained slave devices. The ECC had an RS-485 communication port (used to connect to the daisy chain of slave devices via 4-wire or 2-wire shielded cable), a 10/100 BaseT Twisted Pair port with a standard RJ-45 connector, a 100BaseFx port for optical fiber cable connections (either half-duplex or full-duplex), and a "ECC/CM4000 Connector" for connecting the ECC to the CM4. The ECC supported communications with MODBUS/JBUS devices and "PowerLogic" protocol (SY/MAX" devices). Custom pages could be uploaded from a PC to the CM4 using File Transfer Protocol (FTP). Thus, the tests conducted prior to August of 2000 included all the elements of all the claims 1-41 in the '493 application, and the results of those tests confirmed that all those elements worked for their intended purposes. Specifically:

- the "processor" recited in independent claims 1, 2, 3, 4, 5, 8, 9, 10, 11, 12, 13, 16, 38 and 41 (which corresponds to the CPU shown in Figure 1 on page 8 of Exhibit A, which is the same as Fig. 2 of the '493 application) was successfully tested prior to August of 2000 as both a master device and a slave device in the various "ECC Communications" tests identified in sections 1.1 through 1.6 of Exhibit H;
- the "communications interface" recited in independent claims 1, 3, 4, 5, 6, 7, 9, 11, 12, 14, 15, 38, 39 and 40 (which correspond to the RS485 port shown in Figure 1 on

page 8 of Exhibit A, which is the same as Fig. 2 of the '493 application, and the "slave RS485 devices" referred to on page 7 of Exhibit A) were successfully tested prior to August of 2000 in the various "ECC Communications" tests identified in sections 1.1 through 1.6 of Exhibit H, and in the various "ECC Functionality" tests identified in sections 2.1 through 2.5 of Exhibit H;

- the connected "slave devices" recited in independent claims 1-3, 10-11, 18-19, 25-26, 32-33 and 38 (which correspond to the "slave RS485 devices" referred to on page 7 of Exhibit A) were successfully tested prior to August of 2000 as a master device in the various "ECC Communications" tests identified in sections 1.1 through 1.6 of Exhibit H;
- the use of "real-time information" recited in independent claims 1, 9, 17, 24, 31 and 38 (which corresponds to the "real time, tabular data from the attached devices" referred to on page 36 of Exhibit A) was successfully tested prior to August of 2000 in the various "ECC Communications" tests identified in sections 1.1 through 1.6 of Exhibit H, and in the various "ECC Security" tests identified in section 3.5.1 of Exhibit H;
- the "HTML pages" recited in independent claims 1, 17, 24, 31 and 38 (which correspond to HTML pages referred to on pages 2, 17, 21-22, 36, 50 and 55 of Exhibit A) were successfully tested prior to August of 2000 in the various "ECC Security" tests identified in sections 3.1 through 3.5 in Exhibit H;
- the "JavaScript" recited in claims 4, 12, 20, 27 and 34 (which corresponds to the JavaScript referred to on pages 37 and 40 of Exhibit A) was successfully tested prior to August of 2000 in the various "ECC Security" tests identified in section 3.5.1 of Exhibit H;
- the "SyMax" recited in claims 3, 11, 19, 26 and 33 (which corresponds to the SyMax referred to on pages 7, 38 and 51 of Exhibit A) was successfully tested prior to August of 2000 in the various "ECC Communications" tests identified in sections 1.1.3, 1.2.3, 1.4.3 and 1.5.3 of Exhibit H;
- the "Modbus" recited in claims 3, 11, 19, 26 and 33 (which corresponds to the Modbus referred to on pages 7, 16, 20, 24, 31-33, 38, 51, 53, 55 and 58-60 of Exhibit A) was successfully tested prior to August of 2000 in the various "ECC

Exhibit A) were successfully tested prior to August of 2000 in the various "ECC Communications" tests identified in sections 1.1 through 1.6 of Exhibit H (the "4Wire" tests were full duplex and the "2 Wire" were half duplex);

- the "single physical interface chip capable of supporting dual physical ethernet media types" recited in claims 6, 14, 22, 29, 36 and 39 (which corresponds to the PHY referred to throughout Exhibit A and identified on page 14 of Exhibit A as an "IC," which means an integrated circuit or chip) was successfully tested prior to August of 2000 in all the various ECC tests identified in Exhibit H.

8. The "pseudo-ECL interface" recited in claims 7, 15, 23, 30, 37 and 40 (which corresponds to the pseudo-ECL interface referred to on page 12 of Exhibit A) and the "100BaseFx fast fiber transceiver" recited in claims 7, 15, 23, 30, 37 and 40 (which corresponds to the 100BaseFx fast fiber transceiver referred to on pages 7 and 12 of Exhibit A) were also successfully tested. These tests involved the use of the optical fiber port on the ECC, and it was necessary for us to purchase a special optical-fiber cable for such tests. The attached Exhibit I is a purchase order for that cable, purchased on April 26, 2000.

9. Attached as Exhibit J are copies of exemplary Square D records of bug results after tests conducted on ECC's in June and July of 2000, prior to the first shipments of ECC's to customers in August of 2000.

10. We hereby declare that all statements made herein of our own knowledge are true and that all statements made on information and belief are believed to be true; and, further, that these statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the '493 application or any patent issued thereon.

Dated: September 25, 2006

Timothy G. Curray
Timothy G. Curray

Dated: September 27 2006

Bradley A. Lazenby
Bradley A. Lazenby

Schneider Electric

Contact:
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Price/McNabb
Phone: (704) 375-0123, ext. 319
Fax: (704) 375-0222
BMuller@pricemcnabb.com

www.powerlogic.com

POWERLOGIC® SERIES 4000 CIRCUIT MONITOR NOW AVAILABLE WITH ETHERNET COMMUNICATIONS CARD

Ethernet Connectivity Allows Access to Real-Time Power System Information over The Web

PALATINE, Ill. – July 20, 2000 – A new Ethernet Communications Card (ECC) allows customers to connect their POWERLOGIC® CM4000 Circuit Monitor to their LAN/WAN system for direct Ethernet communications. The ECC provides high-speed communications via 10/100baseT or 100baseFX connections.

"By connecting their power monitoring and control systems directly into their Ethernet system, customers can enhance system communications and maximize the return on their infrastructure investment," said Gary Jones, Director of the Power Monitoring Organization within Square D. "Adding the ECC to the POWERLOGIC System is one more step in our efforts to meet the demand of customers for open network devices."

Based on plug and play technology, the ECC plugs into an expansion slot on the circuit monitor much like a video card plugs into the expansion slot in a PC. The connection to the Ethernet network can be made using either UTP or fiber cabling. An RS-485 Modbus master port on the ECC supports a daisy-chain of up to 31 additional devices, allowing the CM4000 with ECC to act as an Ethernet gateway for the devices.

The ECC supports Modbus/TCP protocol. Embedded HTML pages allow for easy device setup and supply real-time power system information from the CM4000 circuit monitor through a standard web browser. Similar information can also be viewed for devices daisy-chained to the ECC's onboard RS-485 port.

Located in LaVergne, Tenn., the Power Management Organization was created within Square D in 1989 to develop, design and market power monitoring and control systems and analytical services. The Power Management Organization offers a full range of products and services, including power monitoring hardware and software, lighting control hardware and software and a variety of engineering services.

Schneider Electric is the World's Power and Control Specialist, with operations in 130 countries and 67,500 employees worldwide. The company reported 1999 sales of approximately $8.4 billion. Schneider Electric is headquartered in Paris, France and has four major brands – SQUARE D, MODICON, TELEMECANIQUE and MERLIN GERIN.

The full line of electrical distribution equipment includes circuit breakers, load centers, panelboards, switchboards, low and medium voltage switchgear, unit substations, transformers, safety switches, busway and wire management, power quality and power monitoring equipment. Services include equipment maintenance and repair as well as maintenance contracts and power management services.

###

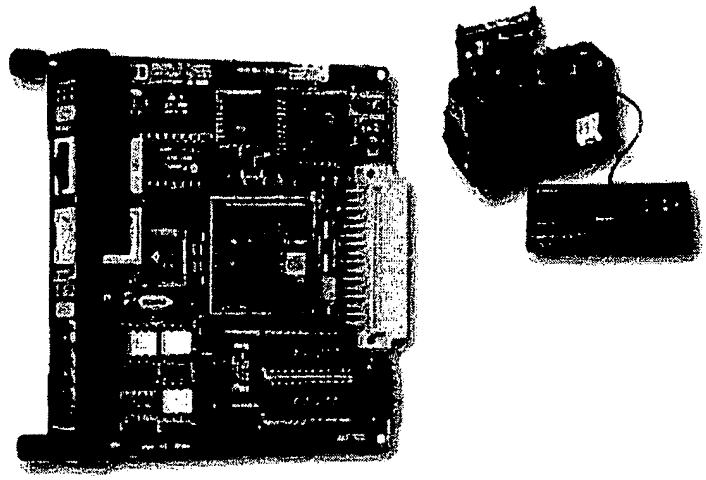
This release is submitted for consideration in both print and Web publications.

POWERLOGIC Ethernet Communication Card

The POWERLOGIC® Ethernet Communication Card allows direct connection of POWERLOGIC Circuit Monitors and POWERLOGIC compatible devices to any TCP/IP based network.

POWERLOGIC Ethernet Communication Card Features

- Provides direct Ethernet TCP/IP communication for the POWERLOGIC Series 4000 circuit monitor
- Utilize existing Ethernet LAN/WAN
- View data and information through embedded HTML pages on a standard web browser
- Embedded HTML pages for setup and configuration
- 10/100 BaseT and 100 BaseFX ports
- Supports Modbus/TCP
- RS485 port supports up to 31 devices over a mixed mode daisy chain, i.e., SY/MAX, Modbus, and Jbus
- Mounts directly into expansion slot on Series 4000 circuit monitor
- Downloadable firmware via Internet



The explosion in information technology networking has created a natural evolution for power monitoring and control systems toward high-speed open communication networks. POWERLOGIC Power Monitoring and Control Systems are rapidly leading the industry in this direction with the latest development for the Series 4000 Circuit Monitor, the Ethernet Communication Card.

Direct Connection to Ethernet

The Ethernet Communication Card (ECC) provides Series 4000 Circuit Monitors direct high speed Ethernet connection to TCP/IP-based LAN/WAN networks. The ECC uses standard UTP RJ-45 and fiber optic LC connectors on the same board for flexibility in network cabling. Modbus/TCP protocol allows you a wider range of connectivity to include more products and gives network architecture more flexibility. Communicating at 10/100 megabaud speeds, the Series 4000 Circuit Monitor with the ECC puts fast access to information at your fingertips.

Easy Installation, Setup, and Data Viewing

The ECC easily installs into an expansion slot on the circuit monitor and connects by either UTP or fiber. A standard web browser gives access to embedded HTML pages that guide you through the setup and configuration process with ease. The power of the circuit monitor is now at your service with browser access to web pages displaying real-time data. Five embedded HTML pages are customizable to meet your needs and can be created on a desktop PC then uploaded over the Ethernet through the ECC.

Information is also available from devices daisy-chained to the onboard RS-485 port. The port supports mixed mode communications including SY/MAX, MODBUS, and JBUS protocols. Up to 31 defined devices can be supported, 64 with a repeater.

POWERLOGIC Ethernet Communication Card

Technical Specifications

Control Power Input Specifications

ECC21 .... Derives control power directly from the Circuit Monitor

Environmental Specifications

Ambient Operating Temperature .... -25 to 70°C
Ambient Storage Temperature .... -40 to 85°C
Relative Humidity Rating (non condensing) .... 5 to 95%
Altitude Range .... -200 to +10,000 ft

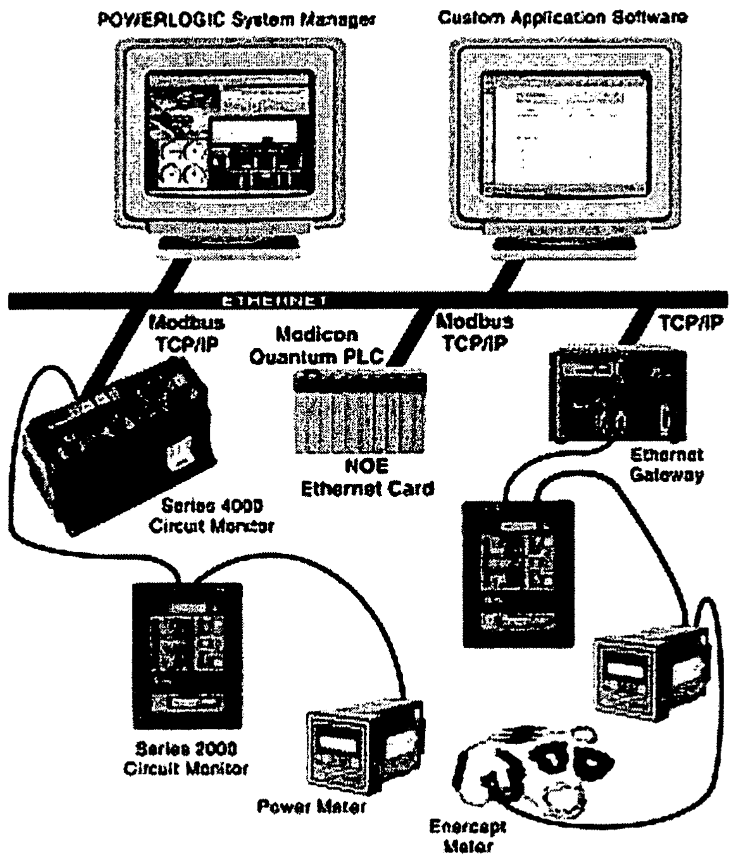
Standard Compliance

Electromagnetic Interference
Radiated .... FCC Part 15 Class A/CE Heavy Industrial
Conducted .... FCC Part 15 Class A/CE Heavy Industrial
Electrostatic Discharge .... IEC 1000-4-2 Level 3
Electrical Fast Transient ... IEC 1000-4-4 Level 3
Immunity to Surge .... IEC 1000-4-3 Level 4
Immunity Radiated .... IEC 1000-4-3 Level 3

Ethernet-based POWERLOGIC Power Monitoring Systems

The POWERLOGIC Power Monitoring and Control System with the Series 4000 Circuit Monitor and ECC allows you to leverage your existing Ethernet technology to satisfy your power monitoring and control system needs. Access to power and energy data, power quality, and other information is now available over virtually any existing communication infrastructure, including the Internet.

The combination of the Series 4000 Circuit Monitor and ECC provides greater expansion and flexibility in existing monitoring and control systems. As your POWERLOGIC system expands (the number of users increase, and additional devices are installed), you will be able to use standard off-the-shelf products to meet your specific network requirements.



Ordering Information

Type	Description
ECC21	POWERLOGIC Ethernet Communication Card

SQUARE D
Schneider Electric

17-Aug-00 11:34

ORDER DATA REPORT

Q2C NO: 14105460 REPRINT ORDER ACCOUNT No: 15173 P.O. NO: ESI4873

Sold To:
ENRON ENERGY SERVICES
611 ANTON BLVD SUITE 700
COSTA MESA CA 92626

Ship To:
ESI- LAKE ELSINORE POWERLOGIC
SOUTHERN CALIFORNIA EDISON
7300 FENWICK LANE
WESTMINSTER CA 92683

SALES OFFICE	LOS ANGELES
ENTERED BY	STEVE AGARWAL
SPD AUTHORIZER	TERESA A LENEAVE
CUSTOMER	ENERGY SERVICES INC
SPECIFIER	
Project Mgr	FERNANDO M ORTIZ
Project Mgr Loc	LOS ANGELES

13000033

Loc	Itm	Sub Ln	Ship Schd	Rev	Catalog/Description	Order Qty	Unfill Qty	Stock Stat	Purch Line #	Price	PD Cat	PD Sub	Line Code
048	003	00	01	00	ECC21 ETHERNET COMMUNICATION CARD	1	1			575.00	09780		9695

Prog Pnt: Assembly

Not Before: Cust Req Ship: Committed To: Orig Prom: 08/30/2000 Curr Prom: 08/30/2000
Routing: STANDARD Carrier: STANDARD
Sub Line Descr: Designations:

Ship To:
JIMCO ELECTRIC
JIMCO ELECTRIC
26752 OAK AVENUE
UNIT "H"
SANTA CLARITA CA 91351

Action Stat: N

UPS 1Z1920X10326?0?63

** END OF REPORT **

REVIEWED B
REVIEWED

SHIP'D AUG 17 2000

05-Sep-00 12:37

ORDER DATA REPORT

EXPEDITE

Q2C NO: 14216687 REPRINT ORDER ACCOUNT No: 17254 P.O. NO: 532606

SALES OFFICE	CHICAGO FIELD SALES OFFICE
ENTERED BY	LARRY A NORGAARD
SPD AUTHORIZER	SUSAN E HAYES
CUSTOMER	FERMI NATIONAL ACCELERATOR LAB
SPECIFIER	
Project Mgr	DENNIS J HAVLICEK
Project Mgr Loc	CHICAGO FIELD SALES OFFICE

Sold To:
FERMILAB ACCTS PAYABLE
PO BOX 5000
BATAVIA IL 60510

Ship To:
FERMILAB
RECEIVING WAREHOUSE 2
KIRK RD & WILSON
BATAVIA IL 60510

Markings: ~~CUST PO# 532606~~

CM-11000396-398
VM-12000396-398

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048	001	00	01	00	CM4000	3 ✓	3			4,582.65	09780		9695

POWERLOGIC CIRCUIT MONITOR w/ ADVANCED PQ
Prog Pnt: Assembly

Not Before: Cust Req Ship: Committed To: Orig Prom: 09/12/2000 Curr Prom: 09/12/2000
Routing: AIR Carrier: NEXT DAY DELIVERY UPS RED
Sub Line Descr: Designations:

Action Stat: N

1300038-40

Loc	Itm	Sub Ln	Ship Schd	Rev	Catalog/Description	Order Qty	Unfill Qty	Stock Stat	Purch Line #	Price	PD Cat	PD Sub	Line Code
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Prog Pnt: Assembly

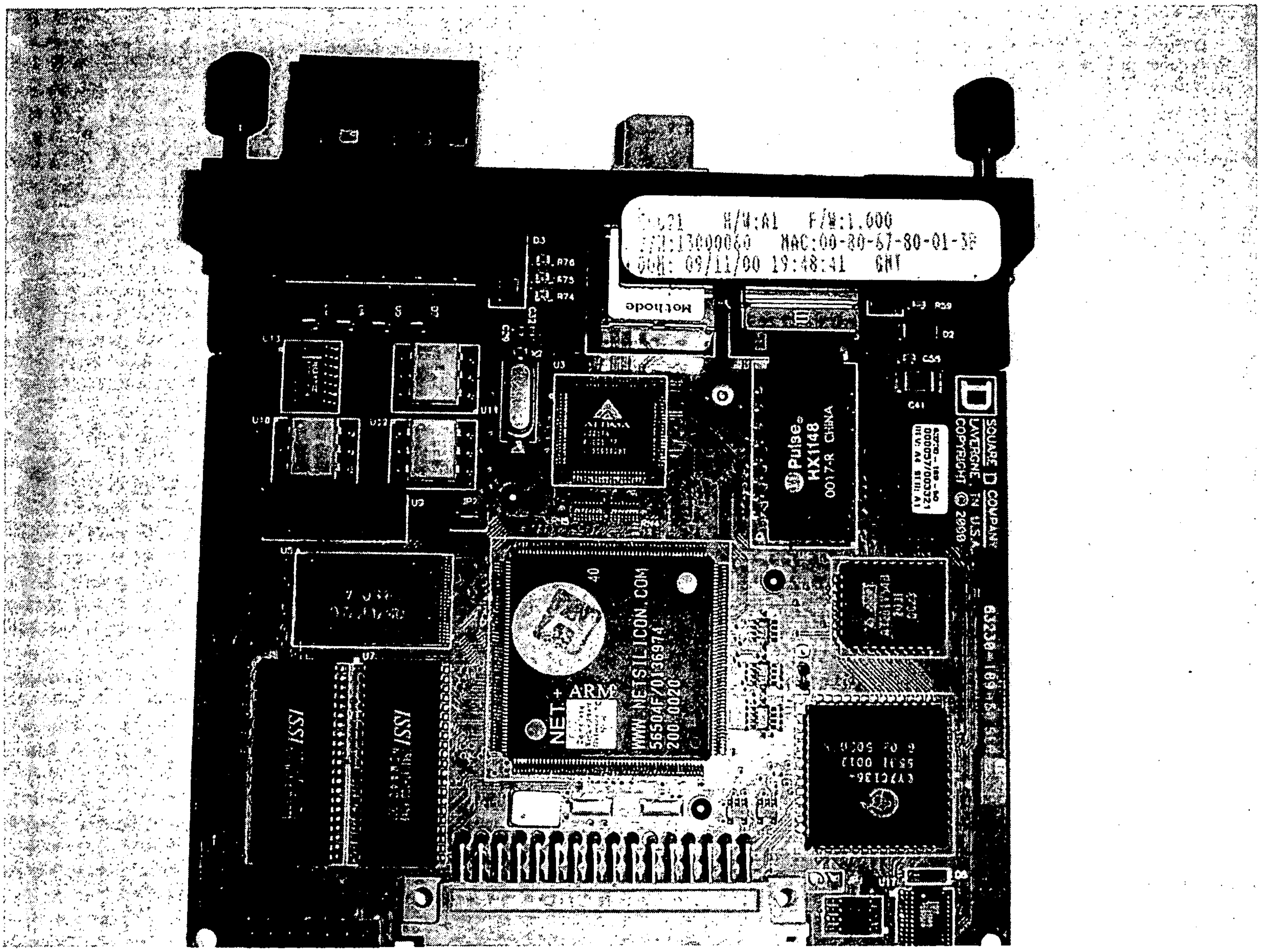
Not Before: Cust Req Ship: Committed To: Orig Prom: 09/12/2000 Curr Prom: 09/12/2000
Routing: AIR Carrier: NEXT DAY DELIVERY UPS RED
Sub Line Descr: Designations:

Action Stat: N

Okay to ship per James Clark

UPS 121920X1013770905

SHIP'D SEP 05 2000


H/W:A1 F/W:1.000
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Pulse
HX1148
0017-R CHINA
SQUARE D COMPANY
LAVERGNE, TN U.S.A.
COPYRIGHT © 2000
NET+ARM
WWW.NETSILICON.COM
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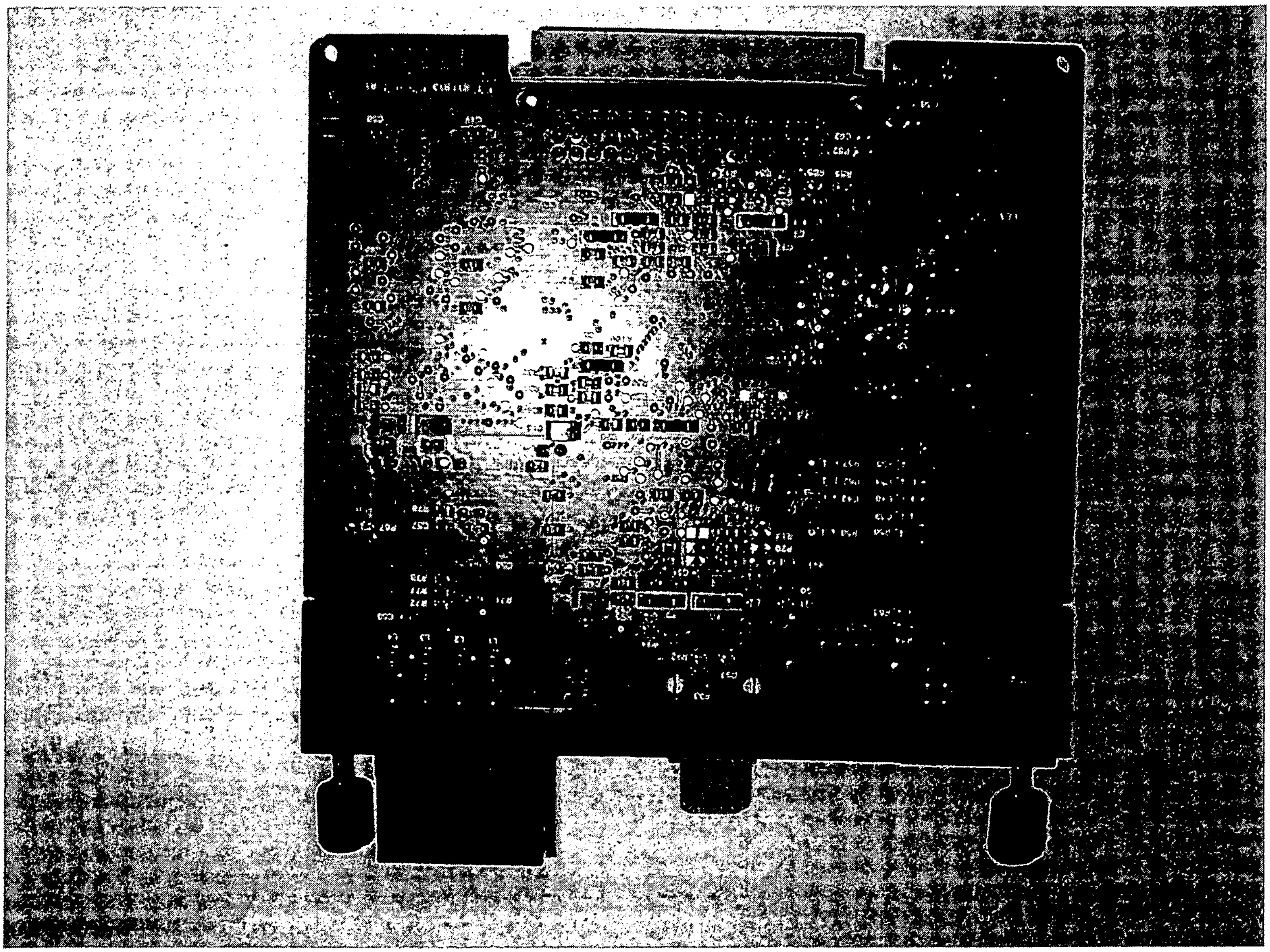
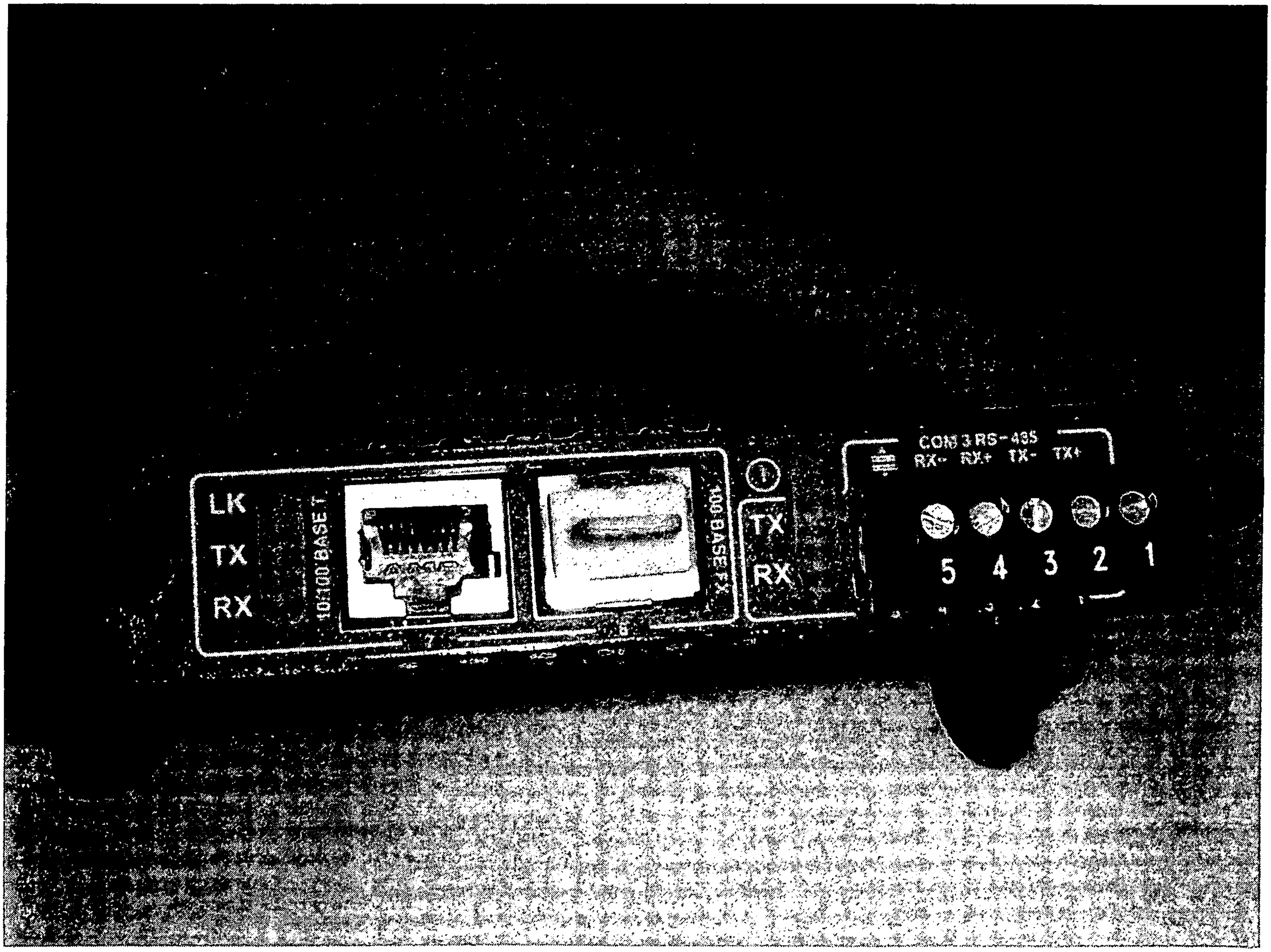
ISSI
ISSI




LK
TX
RX
10/100 BASE T
100 BASE FX
TX
RX
COM 3 RS-485
RX- RX+ TX- TX+
5 4 3 2 1

1. ECC Communications

1.1 4 Wire RS485 verification at 9600 baud rate

1.1.1 **Powerlogic Protocol:** Create a system containing 32 devices (The 1st device is the host CM4 containing the ECC. Include a combination of CM2s and PMs) to use the powerlogic protocol. Go online with the system and verify that all devices talk. Perform a communications test on the system and verify that it passes.

1.1.2 **Modbus Protocol:** Create a system containing 32 devices (The 1st device is the host CM4 containing the ECC. Include a combination of CM4s and PMs) to use the modbus protocol. Go online with the system and verify that all devices talk. Perform a communications test on the system and verify that it passes.

1.1.3 **Mixed Mode (Powerlogic, Modbus, Jbus, &/or Symax):** Create a system containing 32 devices (The 1st device is the host CM4 containing the ECC. Include a combination of CM4s, CM2s, and PMs), which will include different protocols. Go online with the system and verify that all devices talk. Perform a communications test on the system and verify that it passes.

1.2 4-Wire RS485 verification at 19.2k baud rate

1.2.1 **Powerlogic Protocol:** Create a system containing 32 devices (The 1st device is the host CM4 containing the ECC. Include a combination of CM2s and PMs) to use the powerlogic protocol. Go online with the system and verify that all devices talk. Perform a communications test on the system and verify that it passes.

1.2.2 **Modbus Protocol:** Create a system containing 32 devices (The 1st device is the host CM4 containing the ECC. Include a combination of CM4s and PMs) to use the modbus protocol. Go online with the system and verify that all devices talk. Perform a communications test on the system and verify that it passes.

1.2.3 **Mixed Mode (Powerlogic, Modbus, Jbus, &/or Symax):** Create a system containing 32 devices (The 1st device is the host CM4 containing the ECC. Include a combination of CM4s, CM2s, and PMs), which will include different protocols. Go online with the system and verify that all devices talk. Perform a communications test on the system and verify that it passes.

1.3 4 Wire RS485 verification at 38.4k baud rate

1.3.1 **Modbus Protocol:** Create a system containing 32 CM4s. The 1st device is the host CM4 containing the ECC. Go online with the system and verify that all devices talk. Perform a communications test on the system and verify that it passes.

1.4 2 Wire RS485 verification at 9600 baud rate

1.4.1 **Powerlogic Protocol:** Create a system containing 32 devices (The 1st device is the host CM4 containing the ECC. Include a combination of CM2s and PMs) to use the powerlogic protocol. Go online with the system and verify that all devices talk. Perform a communications test on the system and verify that it passes.

1.4.2 **Modbus Protocol:** Create a system containing 32 devices (The 1st device is the host CM4 containing the ECC. Include a combination of CM4s and PMs) to use the modbus protocol. Go online with the system and verify that all devices talk. Perform a communications test on the system and verify that it passes.

1.4.3 **Mixed Mode (Powerlogic, Modbus, Jbus, &/or Symax):** Create a system containing 32 devices (The 1st device is the host CM4 containing the ECC. Include a combination of CM4s, CM2s, and PMs), which will include different protocols. Go online with the system and verify that all devices talk. Perform a communications test on the system and verify that it passes.

1.5 2 Wire RS485 verification at 19.2k baud rate

1.5.1 **Powerlogic Protocol:** Create a system containing 32 devices (The 1st device is the host CM4 containing the ECC. Include a combination of CM2s and PMs) to use the powerlogic protocol. Go online with the system and verify that all devices talk. Perform a communications test on the system and verify that it passes.

1.5.2 **Modbus Protocol:** Create a system containing 32 devices (The 1st device is the host CM4 containing the ECC. Include a combination of CM4s and PMs) to use the modbus protocol. Go online with the system and verify that all devices talk. Perform a communications test on the system and verify that it passes.

1.5.3 **Mixed Mode (Powerlogic, Modbus, Jbus, &/or Symax):** Create a system containing 32 devices (The 1st device is the host CM4 containing the ECC. Include a combination of CM4s, CM2s, and PMs), which will include different protocols. Go online with the system and verify that all devices talk. Perform a communications test on the system and verify that it passes.

1.6 2 Wire RS485 verification at 38.4k baud rate

1.6.1 **Modbus Protocol:** Create a system containing 32 CM4s. The 1st device is the host CM4 containing the ECC. Go online with the system and verify that all devices talk. Perform a communications test on the system and verify that it passes.

2. ECC Functionality

2.1 Verify tables and displays

2.1.1 **View tables and verify that the values are correct:** Set up a system containing CM4s, CM2s, Proxima Breakers, and PMs (2 devices per device type). Use 19.2K as the baud rate. Go online with the system and view every table and verify that the tables display the correct information. (Time, Metered Values, & Physical Appearance)

2.1.2 **View meters display for correctness**: View meter displays and verify that they display the correct information. (Time, Metered Values, & Physical Appearance)

2.1.3 **View bar charts and verify that they work correctly:** View bar charts and verify that they display the correct information. (Time, Metered Values, & Physical Appearance)

2.2 Verify GFX diagrams

2.2.1 **View diagram with every type of GFX block:** Create a GFX diagram using all of the different types of blocks and then view each block to see if it updates correctly with the proper values.

2.3 Verify Logging and Alarms

2.3.1 **Set up logging:** Setup a basic logging template and select a CM4, CM2, Proxima Breaker & PM650 for devices to log the basic quantities. Verify that logging is working by viewing historical data and trend plots.

2.3.2 **Set up analog and digital alarms:** Set up an analog and digital alarm for a CM4, CM2, Proxima Breaker, & PM650. Verify that the alarms are working by initiating both the analog and digital alarms making sure that the alarms are annunciated in the alarm log for all devices.

2.3.3 **View active functions and verify that they are correct:** Click on the Function tab and verify that the active functions are getting updated.

2.4 Verify Waveforms

2.4.1 **Retrieve Waveforms:** Retrieve a 4 cycle, 64 cycle, and high-resolution waveform from a CM4 and a CM2.

2.4.2 **Export Waveforms:** Export retrieved waveforms into export folder.

2.4.3 **Import Waveforms:** Import waveforms from export folder.

2.5 Read and Write Registers

2.5.1 **Read register:** Read a single register from a CM2 & CM4 to verify ability to read a register.

2.5.2 **Write register:** Write a value into s register and then read the register to verify that the value was taken.

2.5.3 **Read multiple registers:** Read multiple registers from both a CM2 and CM4 to verify multiple register reads.

2.5.4 **Write multiple registers:** Write multiple registers on both a CM2 and CM4 and then read the registers to verify that the values were taken.

3. ECC Security

3.1 Verify user levels for access rights

3.1.1 **Test the administrator password:** View all tables that are available to the HTML format.

3.1.2 **Test the view only access levels:** While using the user1 password, try to view the HTM pages used for setup. Verify that these pages are not in the list.

3.1.3 **Test none access level:** Verify that no HTML pages are available from a client with no access.

3.1.4 **Verify bit maps for user3 password:** Read register 522 for a client with the user3 password and verify that all the bits are zero.

3.1.5 **Verify bit maps for administrator password:** Read register 522 for a client with the administrator password and verify that all the bits are set to 1 unless designated to be reserved for future use.

3.2 Verify that 10 access tokens can be active at one time

3.2.1 **Access the ECC from 10 sources:** Verify that HTML pages can be view from 10 different clients that have view access.

3.2.2 **Attempt to access the ECC from 11 sources:** Verify that access is denied for the 11th client that is trying to view and HTML page.

3.3 Verify Advanced Setup

3.3.1 **Make sure that this setup is only accessible by the administrator:** Try to access this HTML page without logging in with the administrator password. Verify that this is not allowed.

3.3.2 **Verify default access token expiration time:** With the access expiration time set for the 2 minute default don't request any information from client for 3 minutes. Then try to request for some information and verify that you have to logon again.

3.3.3 **Verify access token expiration time less than default:** Configure the access token to expire after 1 minute and verify that it works. Don't request any information from client for 1. Minute and 30 seconds. Then try to request for some information and verify that you have to logon again.

3.3.4 **Verify access token expiration time greater than default:** Configure the access token to expire after 5 minute and verify that it works. Don't request any information from client for 6. Minutes. Then try to request for some information and verify that you have to logon again.

3.3.5 **Configure the timeout for the CM4:** Change the timeout for the CM4 and then refresh the Advanced Parameters Setup HTML page to verify that the change was accepted.

3.3.6 **Configure the timeout for RS485:** Change the timeout for the RS485 and then refresh the Advanced Parameters Setup HTML page to verify that the change was accepted.

3.4 Verify Control Outputs

3.4.1 **Set up a control output:** Set up control outputs to a CM2, CM4, and a proxima breaker to have associations. Perform control output for these devices and verify that they pass.

3.5 Verify that FTP works

3.5.1 **FTP a custom device table:** FTP a custom HTML table and view it to verify that it works correctly.

3.5.2 **FTP Firmware:** FTP new firmware into a CM4 an verify that it works.

ECC Test Check List

TEST #	TEST	PASS	Fail
1.1.1	4-Wire RS485 Powerlogic 9600		
1.1.2	4-Wire RS485 Modbus 9600		
1.1.3	4-Wire RS485 Mixed Mode 9600		
1.2.1	4-Wire RS485 Powerlogic 19200		
1.2.2	4-Wire RS485 Modbus 19200		
1.2.3	4-Wire RS485 Mixed Mode 19200		
1.3.1	4-Wire RS485 Modbus 38400		
1.4.1	2-Wire RS485 Powerlogic 9600		
1.4.2	2-Wire RS485 Modbus 9600		
1.4.3	2-Wire RS485 Mixed Mode 9600		
1.5.1	2-Wire RS485 Powerlogic 19200		
1.5.2	2-Wire RS485 Modbus 19200		
1.5.3	2-Wire RS485 Mixed Mode 19200		
1.6.1	2-Wire RS485 Modbus 38400		
2.1.1	Table Values		
2.1.2	Meters Displays		
2.1.3	Bar Charts		
2.2.1	GFX Blocks		
2.3.1	Logging		
2.3.1	Alarms		
2.3.3	Active Functions		
2.4.1	Retrieve Waveform		
2.4.2	Export Waveform		
2.4.3	Import Waveform		
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2.5.2	Write Register		
2.5.3	Read Multiple Register		
2.5.4	Write Multiple Register		
3.1.1	Administrator Password		
3.1.2	View Only Access Level		
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3.1.4	User3 Password Bit Map		
3.1.5	Administrator Password Bit Map		
3.2.1	ECC Capable of being Accessed From 10 Sources		
3.2.2	ECC Denies Access From 11th Source		
3.3.1	Advance Setup available only to Administrator		
3.3.2	Default Access Token Expiration		
3.3.3	Less than Default Access Token Expiration		
3.3.4	Greater than Default Access Token Expiration		
3.3.5	Configure CM4 Timeout		
3.3.6	Configure RS485 Timeout		
3.4.1	Control Output		
3.5.1	FTP Custom Table		
3.5.2	FTP Firmware		

Recommended Testing

1) Long distance communications testing per table baud rates to verify distance capabilities

4-Wire

Baud Rate	Max Distance for 1-16 Devices	Max Distance for 17-32 Devices
9600	10,000ft (3,048m)	4,000 (1,219m)
19200	10,000ft (3,048m)	2,500 (762m)
38400	5,000 (1,524m)	1,500 (m)

2-Wire

Baud Rate	Max Distance for 1-16 Devices	Max Distance for 17-32 Devices
9600	10,000ft (3,048m)	4,000 (1,219m)
19200	5,000 (1,524m)	2,500 (762m)
38400	TBD	TBD

SQUARE D COMPANY
GROUPE SCHNEIDER

Power Management Operations
295 Tech Park Drive - Suite 100 Lavergne, Tn. 37086

PURCHASE REQUISITION & CHANGE NOTICE

ROUTING

- ☐ PRODUCTIVE
- ☐ NON-PRODUCTIVE
- ☐ ORDER CHANGE
- ☐ PRICE CHANGE

VENDOR 15580

ARIA TECHNOLOGIES
(STEVE MIEN) x111

PART NO.

PURCHASE ORDER NO 0070313
ACCOUNT NO. 870-370-E103

SHIP VIA	FOB POINT	VENDOR PHONE	TERMS	DELIVER TO
NEXT DAY		(925) 447-7500		JEFF FOWLER

MARK CONTAINERS	☐ REPLACEMENT ☐ NON-REPLACEMENT	TAXABLE	NON TAXABLE	DATE WANTED	DATE PROMISED
				4-27-00	

ITEM	QTY.	DESCRIPTION OR NATURE OF CHANGE	PRICE EACH	TOTAL COST EACH
1	1	HRA 026 - U6 U6 - 10F	$38.20	$38.20
		Duplex Multimode SC to SC 10FT.		
		Shipping - NEXT Day Air		
		4.28 - 1ZE99W490341759116		

DATE OF ISSUANCE 2:30	ISSUED BY	DATE ORDERED VERBAL	PURCHASED BY	EST. COST	TOTAL COST
4-26-00	JEFF FOWLER	4/27	~~JEFF FOWLER~~	$	$

REMARKS:
E103/31730/3703
left voicemail @ 3:00

APPROVALS

PM	MFG	PC	MM	AC	CE	ER
VP	QS-1	QS-2	QA	DC	FE	DP

THIS IS TO CONFIRM AN ORDER PLACED BY PHONE WITH FAXED ON 4/28

FAX 925 454-1265

PE 1232

PVCS Tracker [ecc - tims] - [Query]

File Edit Submit Notify Update Query Report Tools Help

Standard | All Defects

Id	Submitter	Owner	Title
1	Tim Slatton	Brad Lazenby	CM4 not recognizing ECC after power cycle

 # 1 Closed CM4 not recognizing ECC after power cycle

Submitter: Tim Slatton **Submit Date:** 6/7/2000 3:20:27 PM
Owner: Brad Lazenby **Close Date:** 8/22/2000 3:16:15 PM

Functional Area: Unknown **Resolution:** Not a Bug
Priority: High

Description: CM4 not recognizing ECC after power cycle.

CM4 firmware version 10.012

Workaround [7/5/2000 1:32:08 PM(bradl)]:

Make shure CM4 and ECC both have latest firmware and the problem should go away.

Change History:

8/22/2000 3:16:15 PM(tims)	Changed State from Open to Closed
7/5/2000 1:32:08 PM(bradl)	Added Note 'Workaround'
7/5/2000 1:30:38 PM(bradl)	Changed Resolution from To Be Fixed to Not a Bug
7/5/2000 1:30:38 PM(bradl)	Changed Owner from Tim Curray to Brad Lazenby

9/15/2006 11:47:02 AM Query: 1 of 8 Total Bug: 8

PVCS Tracker [ecc - tims] - [Query]

File Edit Submit Notify Update Query Report Tools Help

Standard | All Defects

Id	Submitter	Owner	Title
1	Tim Slatton	Brad Lazenby	CM4 not recognizing ECC after power cycle

#2 Closed ECC showing a default subnet mask of 255.255.255.255

Submitter:	Tim Slatton	**Submit Date:**	6/7/2000 3:21:31 PM
Owner:	Tim Curray	**Close Date:**	7/26/2000 10:21:01 AM
Functional Area:	Unknown	**Resolution:**	Doc. Issue
Priority:	High		

Description: ECC showing a default subnet mask of 255.255.255.255

CM4 Version 10.012

Not a bug [6/13/2000 11:46:22 AM(bradl)]:

This is not a bug. This is one of the ways the ECC is able to tell if a valid IP configuration has been loaded into the CM when the ECC boots up.

Lab Note [6/16/2000 9:42:47 AM(tims)]:

This will have to be placed in the documentation that when setting up a ECC for the first time the subnet mask & IP address must be set. Or no communications thru ECC.

Change History:

7/26/2000 10:21:01 AM(tims)	Changed State from Open to Closed
6/16/2000 9:42:47 AM(tims)	Added Note 'Lab Note'
6/16/2000 9:41:41 AM(tims)	Changed Resolution from Do Not Fix to Doc. Issue

9/15/2006 | 11:46:20 AM | Query: 2 of 8 | Total Bug: 8

PVCS Tracker [ecc - tims] - [Query]

File Edit Submit Notify Update Query Report Tools Help

Standard | All Defects

Id	Submitter	Owner	Title
3	Tim Slatton	Brad Lazenby	ECC not resetting when IP address is set or changed in CM4

3 Closed ECC not resetting when IP address is set or changed in CM4

Submitter:	Tim Slatton	**Submit Date:**	6/9/2000 10:19:23 AM
Owner:	Brad Lazenby	**Close Date:**	8/22/2000 3:16:07 PM
Functional Area:	<<None>>	**Resolution:**	To Be Tested
Priority:	High		

Description: ECC is not resetting when IP Address is set or changed in the CM4.

Change History:

8/22/2000 3:16:07 PM(tims)	Changed State from Open to Closed
7/5/2000 1:33:46 PM(bradl)	Changed Resolution from To Be Fixed to To Be Tested
7/5/2000 1:33:46 PM(bradl)	Changed Owner from Tim Curray to Brad Lazenby

9/15/2006 11:47:59 AM Query: 3 of 8 Total Bug: 8

PVCS Tracker [ecc - tims] - [Query]

File Edit Submit Notify Update Query Report Tools Help

Standard | All Defects

Id	Submitter	Owner	Title
4	Victor Brown	Tim Curray	SMS is showing a false communications loss (error 1108) for ECC host ...

#4 Closed SMS is showing a false communications loss (error 1108) for ECC host device

Submitter: Victor Brown **Submit Date:** 6/28/2000 10:15:18 AM
Owner: Tim Curray **Close Date:** 7/6/2000 9:35:15 AM

Functional Area: MODBUS/TCP **Resolution:** Can't Repeat
Priority: High

Description: SMS is showing a false communications loss (error 1108) for ECC host device. The CM4000 host device still communicates even though there is a communications loss in the active alarm box. I routed to the same CM4000 with a serial communication and a modbus/tcp communication (ECC) and I received a communications loss for just the ECC connection however the device was still metering.

Submitter Note [7/6/2000 9:35:15 AM(victorb)]:

I have not noticed this bug with the latest software build and the latest ECC firmware. This is was probably a SMS bug to begin with.

Change History:

7/6/2000 9:35:15 AM(victorb) Changed Resolution from To Be Fixed to Can't Repeat
7/6/2000 9:35:15 AM(victorb) Changed State from Open to Closed
7/6/2000 9:35:15 AM(victorb) Added Note 'Submitter Note'

9/15/2006 11:48:37 AM Query: 4 of 8 Total Bug: 8

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application No.	:	09/824,493
Filed	:	April 02, 2001
TC/A.U.	:	2157
Examiner	:	Lashonda T. Jacobs
Docket No.	:	SPL-0032/247181-000244USPT
Customer No.	:	30223

CERTIFICATE OF MAILING

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail, postage prepaid, in an envelope addressed to the Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450, on August 13, 2007.

Signature: Carla Rivera

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

SECOND SUPPLEMENTAL 37 C.F.R. 4 1.131 DECLARATION

Dear Sir:

We, Timothy G. Curray and Bradley A. Lazenby, named co-inventors of pending U.S. Patent Application No. 09/824,493 ("the '493 application"), entitled "Ethernet Communications For Power Monitoring System," supplementing our "37 C.F.R. § 1.131 DECLARATION" filed April 25, 2006, and our "SUPPLEMENTAL 37 C.F.R. § 1.131 DECLARATION" filed September 25, 2006, hereby declare:

1. The subject matter claimed in all the pending claims 1-41 in the '493 application was conceived by us prior to June 2, 2000, in the facilities of Square D Company in LaVergne, Tennessee. Evidence of the conception is provided, for example, by the following documents:

   a. The "Design Specification" submitted as Exhibit A with our Declaration filed April 25, 2006 was prepared, and is dated, prior to June 2, 2000. The "Initial Draft Release" and the revisions 2 through 14 on page 2 of that exhibit were also prepared, and are dated, prior to June 2, 2000. As can be seen from the descriptions of the revisions, the ECC was conceived before June of 2000. Exhibit A and all its revisions were made by us at the facilities of Square D Company in LaVergne, Tennessee.

   b. The attached Exhibit K is a series of Monthly Reports prepared by Tim Curray prior to June of 2000. Irrelevant portions of these reports have been redacted, and the portions not redacted relate to the development of the "Ethernet Option Module

(EOM)," which was later identified as the "ECC." These reports clearly show that the ECC had been conceived before those reports were prepared, because the reports discuss advanced development work such as selection and ordering of specific components, whether to use an internal or external RAM interface, PC board layout, preparation of the final schematic and formal design specification, layout of the firmware, etc.

2. The subject matter claimed in all the pending claims 1-41 in the '493 application was reduced to practice by us at least as early as July 20, 2000, in the facilities of Square D Company in LaVergne, Tennessee. As shown by the declarations filed on April 25 and September 7, 2006, the "ECC" product embodying this invention was actually shipped to customers in August of 2000, which fact alone is evidence that the invention was reduced to practice before August of 2000. As stated in the declaration filed September 7, 2000, Square D would not have sold and shipped the ECC without having thoroughly tested the design of the final product to ensure that it would perform the functions described in the sales literature and news releases (e.g., Exhibit C to our declaration filed September 7, 2006) and in the Instruction Bulletin that accompanied each product (see, e.g., the Instruction Bulletin submitted as Exhibit B to our Declaration filed April 25, 2006). We were personally involved in such testing throughout the first eight months of 2000. Many of the tests to which the ECC was subjected prior to the first shipment are described in paragraphs 2 and 3 of our Declaration filed April 25, 2006. Those tests were carried out using test protocols established within Square D and described in an "ECC Test" document attached as Exhibit H to our declaration filed September 7, 2006. Additional evidence that the invention was reduced to practice prior to August of 2000 is set forth in our declaration filed September 7, 2006, and the exhibits accompanying that declaration.

3. From at least June 1, 2000 until the reduction to practice of the subject matter claimed in all the pending claims 1-41 in the '493 application, we worked with due diligence to complete the reduction to practice. We were both employed by Square D Company in LaVergne, Tennessee, and during the months of June and July of 2000, we both spent the majority of our working hours testing and evaluating the performance of the ECC. Exhibit C submitted with our declaration filed September 7, 2006, is a Schneider Electric/Square D news release dated July 20, 2000, announcing that the ECC is "Now Available" (i.e., as of July 20, 2000). This news release specifically mentions that the ECC allowed customers "to connect their POWERLOGIC CM4000 Circuit Monitor to their LAN/WAN system for direct Ethernet

communications," that "An RS-485 Modbus master port on the ECC supports a daisy-chain of up to 31 additional devices, allowing the CM4000 with ECC to act as an Ethernet gateway for the devices," and that "Embedded HTML pages allow for easy device setup and supply real-time power system information from the CM4000 circuit monitor through a standard web browser. Similar information can also be viewed for devices daisy-chained to the ECC's onboard RS-485 port." Additional evidence of our diligence in working on the reduction to practice of the ECC during June and July of 2000 is provided by the following documents:

a. Revisions 15 and 16 on page 2 of the "Design Specification" submitted as Exhibit A with our Declaration filed April 25, 2006 were prepared, and are dated, in June of 2000. Specifically, those revisions were made on June 14 and June 27, respectively.

b. Exhibit J submitted with our declaration of September 7, 2000, contains copies of exemplary Square D records of bug results after tests conducted on ECC's in June and July of 2000.

c. Attached as Exhibit L is a "Measurement Technical Report" dated June 9, 2000, for a Model CM4000 circuit monitor with ECC-63230-169-02. These tests were conducted to measure the radiated immunity of the tested equipment, which included the ECC. The report shows that the tests were conducted on June 2, 2000.

d. Attached as Exhibit M is an "ECC Bezel" drawing, dated June of 2000.

e. Attached as Exhibit N is an "Overlay" drawing of the ECC bezel, dated June 14, 2000.

f. Attached as Exhibit O is a "Final Assembly" drawing of the ECC, dated July 11, 2000.

4. We hereby declare that all statements made herein of our own knowledge are true and that all statements made on information and belief are believed to be true; and, further, that these statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the '493 application or any patent issued thereon.

Dated: June 26, 2007 — Timothy G. Curray (signed)

Timothy G. Curray

Dated: ~~June~~ July 19, 2007 — Bradley A. Lazenby (signed)

Bradley A. Lazenby

10619524.1

SQUARE D COMPANY
Dedicated to Growth • Committed to Quality

GROUPE SCHNEIDER
SCHNEIDER NORTH AMERICA

To: Mike Pyle

From: Tim Curray

cc:

Subject: Monthly Report

Sustaining EGW

More hardware problems! I believe you have been in on most of the details here. We are still waiting on Winsystems to resolve the NE2000/OSI/Shared RAM/Jumper-less Mode Issue. On a good note, they fixed the problems with the charge-pumps on the RS232 transceivers. We are having isolated problems with EGWs during shipping. The CPU and/or Quad Comm cards are still coming unseated even with the plastic rivets. After long conversations with Tim Czereda and Tony Johnson, we all agreed that the best solution would be to return to the temporary deviation involving the foam insert, making it a permanent deviation. There have been a few bugs found in the firmware. One, dealing with Modbus/Jbus, is that the Device ID and Slave ID must match before valid communications will work. I found and pointed out the problem to Brad and he has now fixed it in his implementation. The other is that we were not allowing for Jbus register zero to be requested through the EGW. This has also been fixed. Lastly, there appears to be problems with SMS device types looking for SyMax specific error codes. This becomes a problem when using Modbus-TCP, the ECMs, and/or other "translating protocol" devices. Mike Divinnie has apparently found something similar in the EGW, and I have Brad working on it right now. Once we get the outstanding issue resolved with Winsystems and this problem with the SyMax error codes figured out, I will have to make a new core extractor v1.3.0 and new regular firmware v2.1.0 release.

CM3000 Ethernet Option Module (EOM)

The first pass schematic is complete for now and has been submitted for Peer review. I believe we will have to stick with the 12MIPs part because it is 5Volt tolerant. We may have to change our strategy for the next EGW. It appears we are going to have to change to an external dual-port ram for the inter-processor communications instead of the internal shared ram interface built into the Net+Arm part. It appears that the built in interface may be a bit too slow for our liking. We will now begin the board layout after I have heard back from everyone about the schematics and resolve the shared ram issue. R&D work for firmware implementation schemes and tasks are still being done. More thought has been put into the design specification. I will have to tackle that next. Still waiting for the functional spec to be wrapped up. We also need to get a handle on the Organizationally Unique Identifier (OUI).

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GROUPE SCHNEIDER
SCHNEIDER NORTH AMERICA

To: Mike Pyle

From: Tim Curray

cc:

Subject: Monthly Report

Sustaining EGW

More hardware problems, again! I believe you have been in on most of the details here. This sustaining work is increasing more all the time. I am still trying to come up with a simplified solution to fixing the Y2K problems with the EGW bios and operating system. Also, the ability to have simultaneous outstanding messages on both RS485 ports has been "broken" in any release of EGW firmware after v1.4.0. It was inadvertently broken during the final stages of the implementation of the Modbus/Jbus protocols. Once I get these problems straightened out, there will be a new firmware release, again! Also, weekly calls and support issues are taking up my time more and more. As I am sure you know, all these things impact new development.

CM3000 Ethernet Option Module (CM3000EOM)

The final schematics look in great shape! The only real issue left is the option connector type. The CM3 teams (Elite, Pro) have been changing it almost monthly. I have been waiting in the queue for the PCB for weeks! This is going to effect our ability to deliver by the end of the year. I believe we will be pressed for real estate on the board, and the layout will be a tough one. Thanks for the work on the Organizationally Unique Identifier (OUI). I have begun the firmware layout design with Brad, so he can further his work there. He is making good progress. I have been neglecting the design specification due to the speed at which we are trying to continue the development. However, I am going to have to take time out, and get started on it after the firmware layout is complete. Funny, a lot of the design is going to be done, and then I am going to do the design specification.

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GROUPE SCHNEIDER
SCHNEIDER NORTH AMERICA

To: Mike Pyle

From: Tim Curray

cc:

Subject: Monthly Report

Sustaining EGW

Firmware v2.4.0 has been released. This version is Y2K OK and fixes the ability to have simultaneous outstanding messages on both RS485 ports. Also, as you well know, Technical Support and Engineering Services issues are taking up my time more and more, and are impacting new development.

Sustaining SMS drivers

Technical Support has found some issues with our serial and Modbus/TCP communications using Modbus coils. I believe we have fixed the serial issues, but re-testing must still be done. At first pass, the Modbus/TCP driver looks more severe. It appears that some/one of the coil function code(s) may have not been implemented at all. We are determining the extent of it now.

CM3000 Ethernet Option Module (CM3000EOM)

The final schematics have been handed to Design Services for the PCB layout. As you know, I have been waiting for a slot for some time. This may potentially effect our ability to deliver by the end of the year. Everyone that has taken a look at the board thinks that it is going to be a tough one to lay out due to size constraints. Brad and I have about 75% of the firmware design layout complete. Brad has been making great progress on our message queuing strategy for the EOM firmware. I have begun the EOM Design Specification, but progress is slow due to all the other events (sustaining, board layout, firmware layout, etc). I have accomplished about 15% of the first pass. I am going to attempt to finish the first pass of the design specification during the layout of the board. After the board is laid out, there will be even less time to complete the design specification because of the board debugging and board support package design for the firmware.

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GROUPE SCHNEIDER
SCHNEIDER NORTH AMERICA

To: Mike Pyle

From: Tim Curray

cc:

Subject: Monthly Report

Sustaining EGW

Nothing to report here! Do you believe it? As usual though, Technical Support and Engineering Services issues are still taking up considerable amounts of my time and impacting new development.

Sustaining SMS drivers

All the issues with the serial and Modbus/TCP communications using Modbus coils have been taken care of.

Now, we are dealing with the RS232-485 converter issue. You are aware of the problems here. Also, we will be making an attempt to find the correct path for correcting the sorting algorithms in the drivers.

A new one for you, there appears to be a new issue with using OSI as the transport with NT service pack four or greater. All the details are still a little vague. It appears there may be some timing problem when we initially load the stack for the first usage. This problem causes 304 errors to occur during the online sequence, but they will clear after the first health check. More testing is in progress.

CM3000 Ethernet Option Module (CM3000EOM)

Rodney has begun on the board layout. He has made a lot of good progress. Hopefully there will not be any more delays in this area that will impact our schedule any more.

Brad and I have finished the firmware layout, and I have him continuing with the coding of the message queues/tasks.

I have completed the preliminary scheduling of events/tasks that must be completed before the year-end release.

And finally, I have made a little more progress on the Design Specification, but progress is slow due to all the other events (sustaining/drivers, board layout, firmware layout, etc). My goal now is to focus on the design specification as soon as the SMS driver issues are resolved.

REDACTED

SQUARE D COMPANY
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GROUPE SCHNEIDER
SCHNEIDER NORTH AMERICA

To: Mike Pyle

From: Tim Curray

cc:

Subject: Monthly Report

Sustaining SMS drivers

The RS232/485 converter issue was finally ruled out as a faulty converter. The software group now has one of those new converters we bought. I do not know if you would want to do anything about that or not.

I believe the issue with using OSI as the transport with NT service packs four or greater has been taken care of. I suggested that they test with SMS v3.1, which uses the new SISCO MMS stack. The original testing was done using SMS v3.02a. Since I made this suggestion, there has not been any reported issue.

I found a fairly quick solution to the sorting algorithm in the drivers that allowed for the fix for the Proxima device type. This was added and is still being used by the Software group. I have not heard of any more issues as of late.

Almost all of the past three weeks has been devoted to SMS driver/device type issues. The main ones in particular were the Modbus General Reference File Read/Write issues with the device type, the drivers, and the Power Meter. By the way, I was just informed that there might be another issue with the EGW and/or driver in this same area. I will have to check it out.

Since I am out of the loop with the EGW install package now, I decided to give it a look. I found a few errors in the SMS v3.1 EGW installs. I forwarded all the corrective actions to Mike Divinnie, and he should have them taken care of.

CM3000 Ethernet Option Module (CM3000EOM)

Rodney has been trying to finish-up the board layout. Last I spoke to him, he mentioned that he will probably be finished sometime next week. Once we get some of the boards in, Andre will be able to build them and I will start testing/troubleshooting them. Right now the only components we have not received are the NET+ARM chips. I submitted the PO, but I have not heard anything as of yet.

The Level 1 PHY component is now available only in commercial temperature range. This has got me in a corner. My last hope is that I can find distributors who will qualify/screen the parts for us. Our other options will require a redesign of the board and a lot firmware coding. If you want more information we can talk about it.

Brad is still continuing with a lot of the high-level firmware development. He is continuing the work on the message queuing mechanisms and has done a lot of work on implementing the high-level protocol translations. I also have him documenting all the code to date and what our register list will potentially look like.

And finally again, I have made a little more progress on the Design Specification, but progress is still slow due to all the other events.

REDACTED

Communications Group Memo

SQUARE D COMPANY
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GROUPE SCHNEIDER
SCHNEIDER NORTH AMERICA

To: Mike Pyle

From: Tim Curray

cc:

Subject: Monthly Report

Sustaining EGW

As you are well aware of, there was a bug found in the EGW firmware related to Modbus General Reference File Reads larger than 9. The bug has been found and fixed, and I have built a new release. I will probably sit on it during the rest of the Proxima development/support, and will release it sometime near the software group's release of Proxima support. The software group is using it for the rest of the Proxima development.

CM4000 Ethernet Option Module (CM4000EOM)

I have finally been able to get time to finish the first pass Design Specification! I have distributed it to numerous people and am awaiting feedback. A few people have spoken to me about it.

Rodney has still been trying to finish-up the board layout. He keeps getting pulled off of it to work on higher priority projects. Last I spoke to him, he mentioned that he will probably be finished sometime this week (week of 9-6). Once we get some of the boards in, Andre will be able to build them and I will start testing/troubleshooting them. I have had Andre ordering parts for a while now, and he said that he believes he has everything needed to build them.

Firmware development is still continuing. We have run into a lot of problems with the development tools that are being slow in getting resolved. The main one is the problem with the ARM debugger. It appears from some of the Netsilicon comments that they seem to be more concerned with getting the NET+ARM-40 out with firmware support than tending to our issues.

One quick thing to note, a lot of time is still being lost to sustaining/PAE/Customer support. I think this is a fact of life for now.

PHILIPS

Philips Consumer Electronics Company

MEASUREMENT TECHNICAL REPORT

FOR

SQUARE D COMPANY

295 Tech Park Dr.
Lavergne, TN 37086

Attention: Mr. Scott Northcutt

MODEL CM4000
with ECC-63230-169-02

June 9, 2000

This report concerns: CE Verification of Industrial Equipment (Radiated Immunity) (EN 50082-2)

This report was prepared by:

PHILIPS CONSUMER ELECTRONICS COMPANY
ONE PHILIPS DRIVE
P.O. BOX 14810.
KNOXVILLE, TN. 37914-1810

A Division of Philips Electronics
North America Corporation
One Philips Drive,
P.O Box 14810
Knoxville, TN 37914-1810
Tel: (423) 521-4316

Our Commitment To Excellence Is
Total Customer Satisfaction

LIST OF EXHIBITS

PCEC REPORT #01542-2

List of Appendices

PCEC REPORT #01542-2

Engineering Statement

All measurement data on the attached reports was taken pursuant to the European Normative EN 50082-2 by Philips Testing Service located in Knoxville, Tennessee. Although this data is taken under stringent laboratory conditions and to the best of our knowledge, represents accurate data, it must be recognized that emissions from this type equipment may be greatly affected by the final installation of the equipment. Therefore, Philips Consumer Electronics Company, while supporting the accuracy of the data in this report, takes no responsibility for use of equipment based on these tests. The manufacturer of this equipment must take full responsibility for any field problems which may arise, and agrees that Philips Consumer Electronics Company, in performing its functions in accordance with its objectives and purposes, does not assume or undertake to discharge any responsibility of the manufacturer to any other party or parties.

Testing on the Square D Company CM4000 with ECC-63230-169-02 was performed on 6-2-00. The data contained within this technical report was compiled and approved by:

Richard K. Moyers
Lead Business Coordinator, EMC

Fred A. Fisher
Manager Regulatory FCC/DOC

System Test Configuration

The Square D Model CM4000 with ECC-63230-169-02 was configured into a mulated installation.

The specific setup for each test performed is described in Section 3 Test Procedures.

PROCEDURE-RADIATED IMMUNITY
(ref. EN 61000-4-3)

For the radiated immunity test, the EUT was configured and tested as that described in section 2. System Test Configuration of this report. The EUT was subjected to a modulated electromagnetic field equal to 10 V/m (where allowed, the field strenght was reduced to 3 V/m). The EUT was tested over the frequency range of 80 - 1000 MHz at both horizontal and vertical polarities.

Equipment Used During Testing:

AR 100W1000	s/n: 17520	Amplifier
AR FM2000	s/n: 16521	Field Strength Meter
AR FP2000	s/n: 16411	Isotropic Field Probe
AR 888	s/n: 16860	Leveling Unit
HP 8656A	s/n: 06137	RF Signal Generator
EMCO 3108	s/n: 2072	Bicon Antenna
EMCO 3101	s/n: 3384	Connical Antenna

PROCEDURE-RADIATED IMMUNITY
(ref. EN 61000-4-3)

For the radiated immunity test, the EUT was configured and tested as that described in section 2. System Test Configuration of this report. The EUT was subjected to a modulated electromagnetic field equal to 10 V/m (where allowed, the field strenght was reduced to 3 V/m). The EUT was tested over the frequency range of 80 - 1000 MHz at both horizontal and vertical polarities.

Equipment Used During Testing:

AR 100W1000	s/n: 17520	Amplifier
AR FM2000	s/n: 16521	Field Strength Meter
AR FP2000	s/n: 16411	Isotropic Field Probe
AR 888	s/n: 16860	Leveling Unit
HP 8656A	s/n: 06137	RF Signal Generator
EMCO 3108	s/n: 2072	Bicon Antenna
EMCO 3101	s/n: 3384	Connical Antenna

REPORT# 01542-2

EN 61000-4-3
Radiated Immunity Results

MODEL:CM4000 W/ ECC-63230-169-02
MFG:SQUARE 'D'

TESTED BY:DSEAY
TEST DATE: 6-2-00

Test Conditions:

Temperature:72 F

Relative Humidity:32%

Frequency Range Tested: 80 - 1000MHz

Test Field Strength (V/M) : 10

AZIMUTH TESTED:1

Frequencies Affected:

FREQUENCY (MHZ)	TEST SIGNAL LEVEL	NON-INTERFERENCE LEVEL	COMPLIANCE YES / NO
80-174	10 V/M	10 V/M	YES
174-230	3 V/M	3 V/M	YES
230-470	10 V/M	10 V/M	YES
470-790	3 V/M	3 V/M	YES
790-1000	10 V/M	10 V/M	YES

** The equipment was tested and found to comply with the specifications called out **
in EN 61000-4-3 & 50204.

Tested by: Derek Seay Test Date: 6-2-00

REPORT# 01542-2

EN 61000-4-3
Radiated Immunity Results

MODEL:CM4000 W/ ECC-63230-169-02
MFG:SQUARE 'D'

TESTED BY:DSEAY
TEST DATE: 6-2-00

Test Conditions:

Temperature:72 F   Relative Humidity:32%

Frequency Range Tested: 80 - 1000MHz

Test Field Strength (V/M) : 10   **AZIMUTH TESTED:2**

Frequencies Affected:

FREQUENCY (MHZ)	TEST SIGNAL LEVEL	NON-INTERFERENCE LEVEL	COMPLIANCE YES / NO
80-174	10 V/M	10 V/M	YES
174-230	3 V/M	3 V/M	YES
230-470	10 V/M	10 V/M	YES
470-790	3 V/M	3 V/M	YES
790-1000	10 V/M	10 V/M	YES

** The equipment was tested and found to comply with the specifications called out **
in EN 61000-4-3 & 50204.

Tested by: Derik Seay   Test Date: 6-2-00

REPORT# 01542-2

EN 61000-4-3
Radiated Immunity Results

MODEL:CM4000 W/ ECC-63230-169-02
MFG:SQUARE 'D'

TESTED BY:DSEAY
TEST DATE: 6-2-00

Test Conditions:

Temperature:72 F

Relative Humidity:32%

Frequency Range Tested: 80 - 1000MHz

Test Field Strength (V/M) : 10

AZIMUTH TESTED:3

Frequencies Affected:

FREQUENCY (MHZ)	TEST SIGNAL LEVEL	NON-INTERFERENCE LEVEL	COMPLIANCE YES / NO
80-174	10 V/M	10 V/M	YES
174-230	3 V/M	3 V/M	YES
230-470	10 V/M	10 V/M	YES
470-790	3 V/M	3 V/M	YES
790-1000	10 V/M	10 V/M	YES

** The equipment was tested and found to comply with the specifications called out **
in EN 61000-4-3 & 50204.

Tested by: Derek Seay

Test Date: 6-2-00

REPORT# 01542-2

EN 61000-4-3
Radiated Immunity Results

MODEL:CM4000 W/ ECC-63230-169-02
MFG:SQUARE 'D'

TESTED BY:DSEAY
TEST DATE: 6-2-00

Test Conditions:

Temperature:72 F

Relative Humidity:32%

Frequency Range Tested: 80 - 1000MHz

Test Field Strength (V/M) : 10

AZIMUTH TESTED:4

Frequencies Affected:

FREQUENCY (MHZ)	TEST SIGNAL LEVEL	NON-INTERFERENCE LEVEL	COMPLIANCE YES / NO
80-174	10 V/M	10 V/M	YES
174-230	3 V/M	3 V/M	YES
230-470	10 V/M	10 V/M	YES
470-790	3 V/M	3 V/M	YES
790-1000	10 V/M	10 V/M	YES

** The equipment was tested and found to comply with the specifications called out **
in EN 61000-4-3 & 50204.

Tested by: Derek Seay Test Date: 6-2-00

SUMMARY OF RESULTS

PCEC REPORT #01542-2

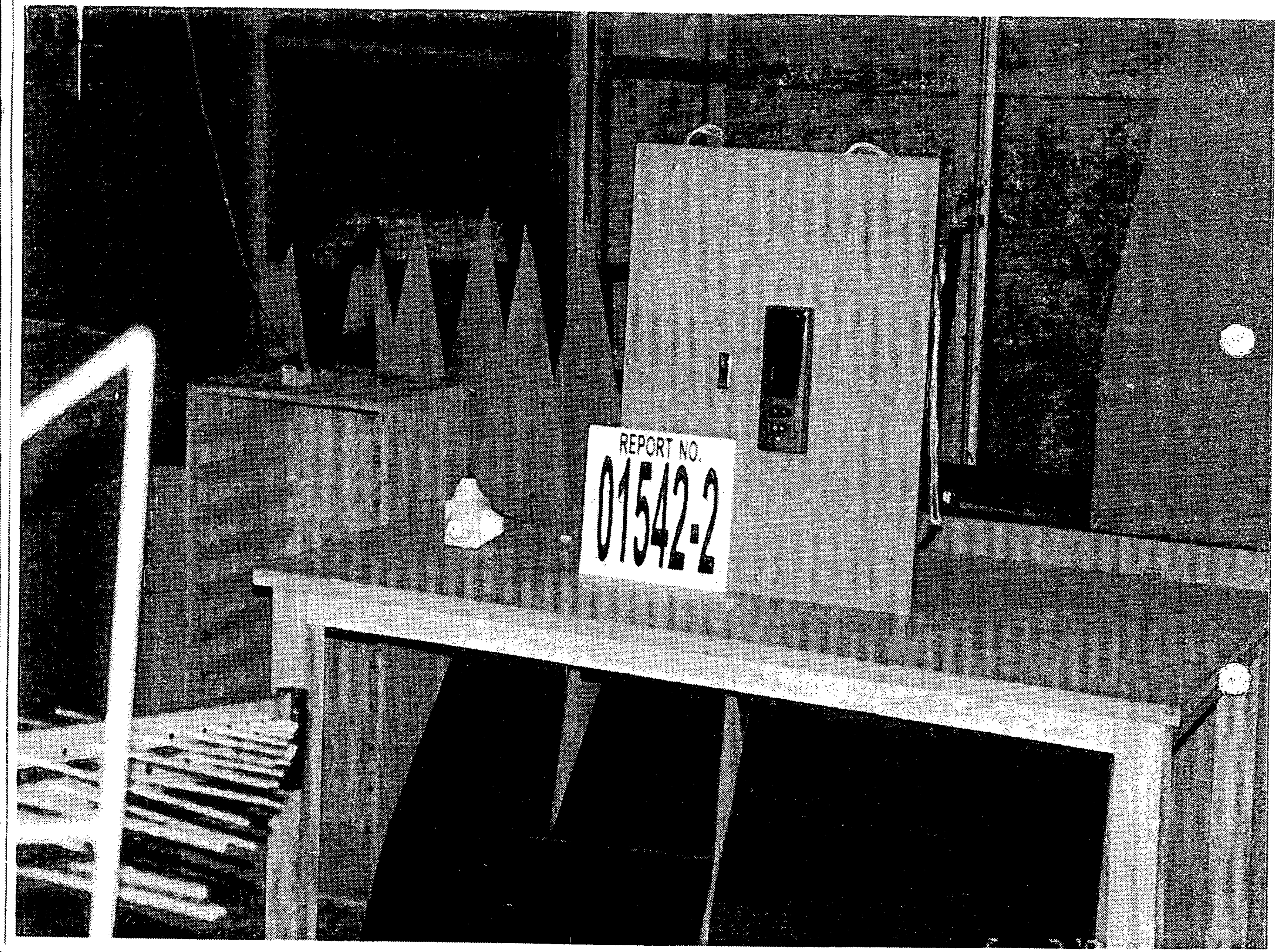
This report applies only to the equipment tested, Square D Company Model CM4000 with ECC-63230-169-02, and indicates that the previously mentioned equipment **MEETS** the requirements as set forth by the following standards:

Radiated Immunity (EN 61000-4-3)

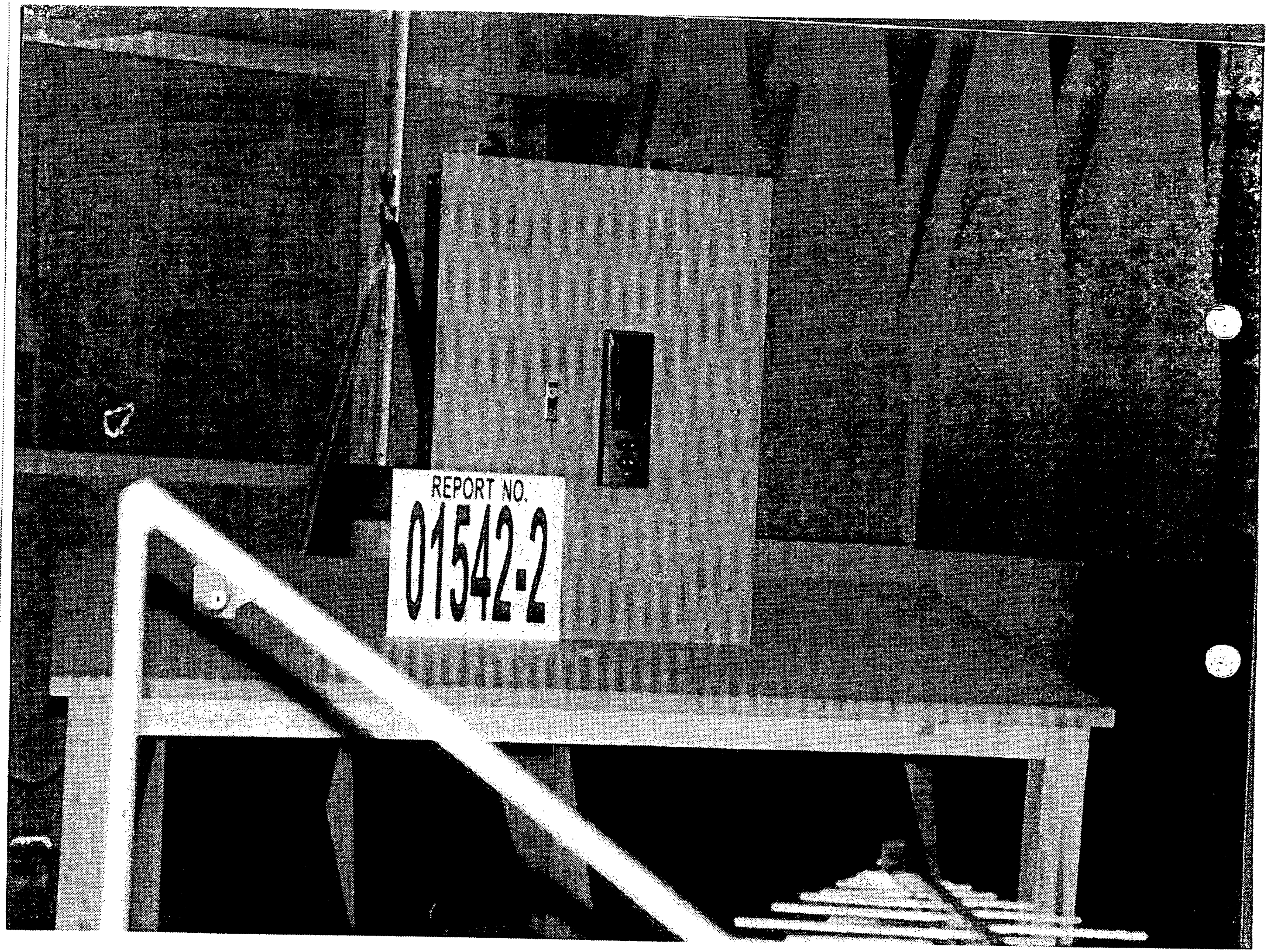
Mass production of final instrument systems utilizing the exact electrical/ mechanical components, lead dress, and RF ground paths as tested by PCEC will not likely cause harmful interference to any radio communication, radio navigation or safety services. Any deviation in design from the system tested by our facility will require further verification of Compliance by PCEC. This test report is the confidential property of Square D Company. Extracts from this test report shall not be reproduced except in full without our written approval.

PHILIPS CONSUMER ELECTRONICS COMPANY

Fred A. Fisher
Manager Regulatory FCC/DOC


REPORT NO.
01542-2

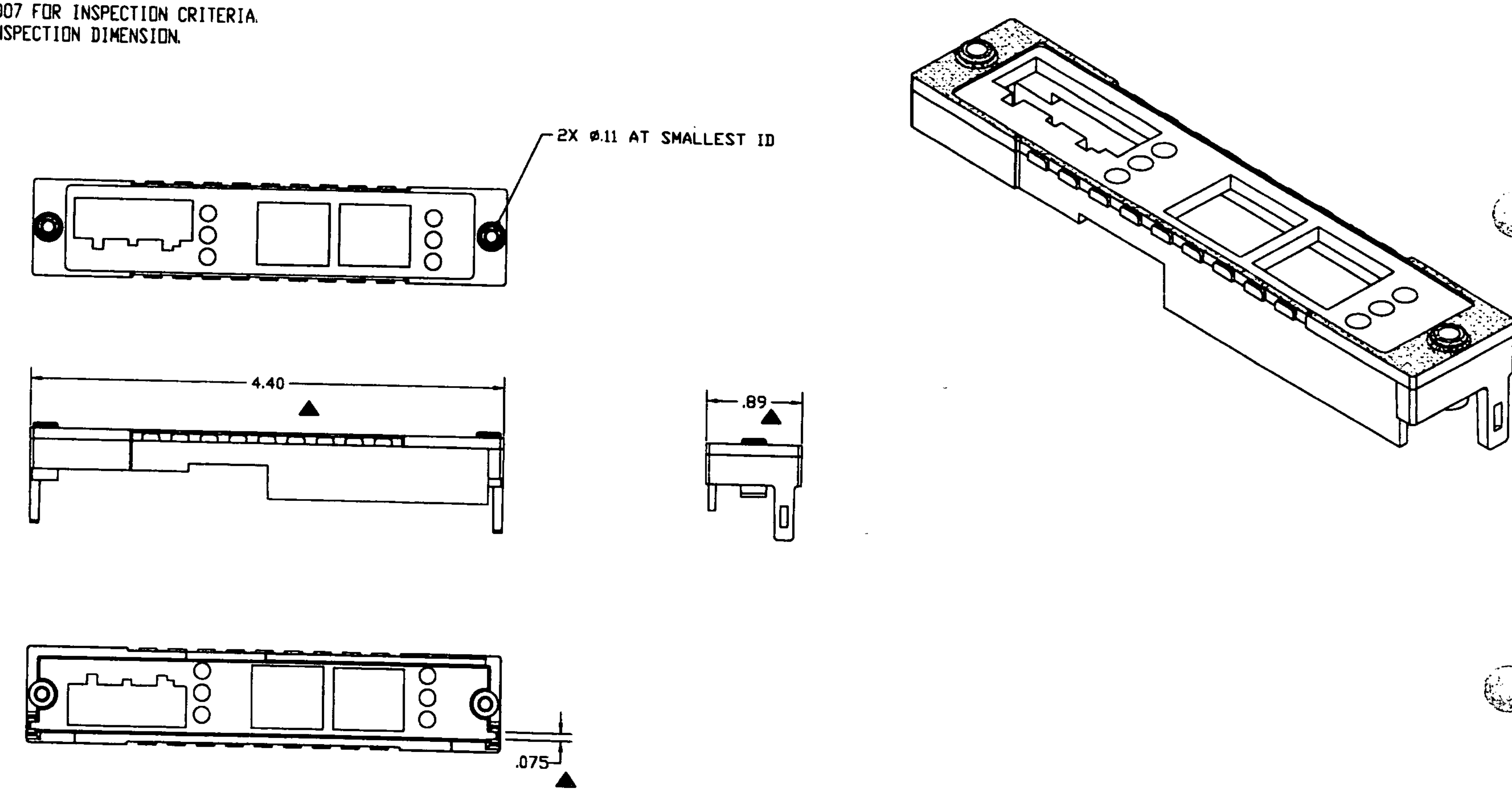

REPORT NO.
01542-2


REPORT NO.
01542-2

PART NO.	SHEET
63230-304-01	1 OF 1

NOTES:

1. VENDOR: FLORIDA CUSTOM MOLD
2. RED SHADED SURFACES ARE CONDITION 'A'.
   ALL UNSHADED SURFACES ARE CONDITION 'C'.
3. SEE DOCUMENT II1007 FOR INSPECTION CRITERIA.
4. '▲' DENOTES AN INSPECTION DIMENSION.



REV.	ECN NO.	DATE	BY
A2	PH00077	7/00	JF
B1	PH00138	10/00	JF

DO NOT SCALE-WORK TO DIMENSIONS

APPROVALS		DATE
DRAWN	R. GREER	6/00
CHECKED		
ENGINEERING		
MANUFACTURING		

TITLE: ECC BEZEL
C3-C4 OPTION BAY

MATERIAL: MAKROBLEND EL700-1510 BLACK

PART NO.: 63230-304-01

FILENAME: 63230_304_001_B01_01

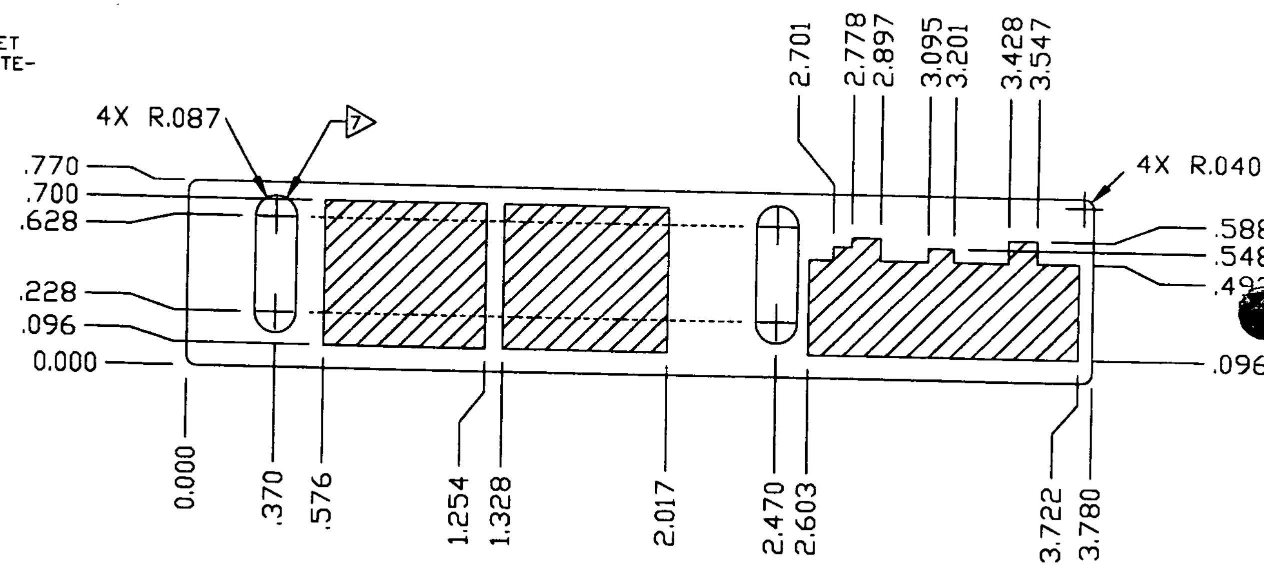
SQUARE D COMPANY
LAVERGNE, TENNESSEE, U.S.A.

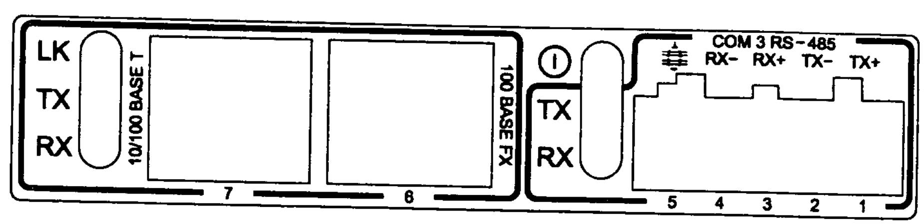
SHEET	SCALE	REV
1 OF 1	--	B1

PART NO. 63230-304-04 | SHEET 1 OF 2

NOTES:

1. MATERIAL: POLYESTER/POLYCARBONATE .007 THICKNESS VELVET SHEET STOCK WITH SELECTIVE REAR MOUNTING POLYCARBONATE-COMPATIBLE PERMANENT ADHESIVE LAYER AND PROTECTIVE, REMOVEABLE SPLIT/SLIT BACKER.
2. MATTE FINISH ACROSS ENTIRE SURFACE.
3. ALL GRAPHICS SHALL BE PRINTED WITH PROCESS WHITE, BACKGROUND SHALL BE ANTHRACITE GRAY (RAL7016); COLOR SAMPLE PROVIDED BY PMO.
4. OVERLAYS TO BE BAGGED IN GROUPS OF "100". BAG SHALL BE LABELED WITH PART# (63230-304-04), QTY: 100, AND DATE CODE.
5. WHEN GENERATING ARTWORK FROM E-FILE ENSURE IT IS 1:1; REFERENCE DIMENSIONED VIEW.
6. THE THREE (3) CROSS HATCHED AREAS ARE CUT-OUTS WITH MATERIAL REMOVED.
7. THE TWO OBLONG SHAPES ARE CLEAR/FROSTED LENSES. NO ADHESIVE ALLOWED IN THESE AREAS.
8. VENDOR: HALLMARK NAMEPLATE
   MT. DORA, FLORIDA
   1717 E. LINCOLN AVE.
   (800)-874-9063





ACTUAL ARTWORK REPRESENTATION

ARTWORK SHOWN 2:1

REV.	ECN NO.	DATE	BY
A1	PH00077	7/00	JF

DO NOT SCALE-WORK TO DIMENSIONS

STANDARD TOLERANCES UNLESS OTHERWISE SPECIFIED

APPROVALS: DRAWN C. GRAFF 6/14/00; CHECKED; ENGINEERING; MANUFACTURING

SQUARE D COMPANY

TITLE: OVERLAY ECC BEZEL

MATERIAL: SEE NOTES

PART NO. 63230-304-04

SHEET 1 OF 2 | SCALE 2:1 | REV A1

63230 304 004 A01 01

04/12/00

ECN NUMBER	CHANGED FROM	DESCRIPTION OF CHANGE	DATE	INIT
	Z3	-CENTERED '100 BASE FX' WITH SIDE OF CUTOUT -CHANGED LINE SPACING BEFORE '5' AND AFTER '1' -ADDED NOTE 8	7/00	JF

PART NO. 63230-304-04 SHEET 2 OF 2

CHANGE HISTORY

TITLE OVERLAY ECC BEZEL

PART NO. 63230-304-04

SQUARE D COMPANY
LAVERGNE, TENNESSEE, U.S.A.

FILENAME 63230_304_04_A01_02

SHEET 2 OF 2 REV A1

04/12/00

PART NO.	SHEET
63230-304-100	1 OF 3

QTY	DESCRIPTION	VENDOR/ PART NO./ MATERIAL	NOTES	ITEM NO.
1	BEZEL ASSY	63230-304-05	1	1
1	PCBA, ECC	63230-169-50	1	2
1	CONNECTOR	25410-00028	3	3
5	ID LABEL	EXPENSE	2, 7, 10	4
1	INSTRUCTION MANUAL, ENGLISH	63230-304-201	6	5
1	ESD BAG	EXPENSE	5	6
1	CARTON LABEL	63230-018-230	9	7
1	CARTON	63230-208-54	4	8
				9
				10
1	REGISTRATION CARD	63220-060-79	7	11
-	SERIES CONTROL RECORD	63230-002-214	2	12
				13
1	CM4 TECHNICAL LIBRARY CD ASSY	63230-300-73	6	14

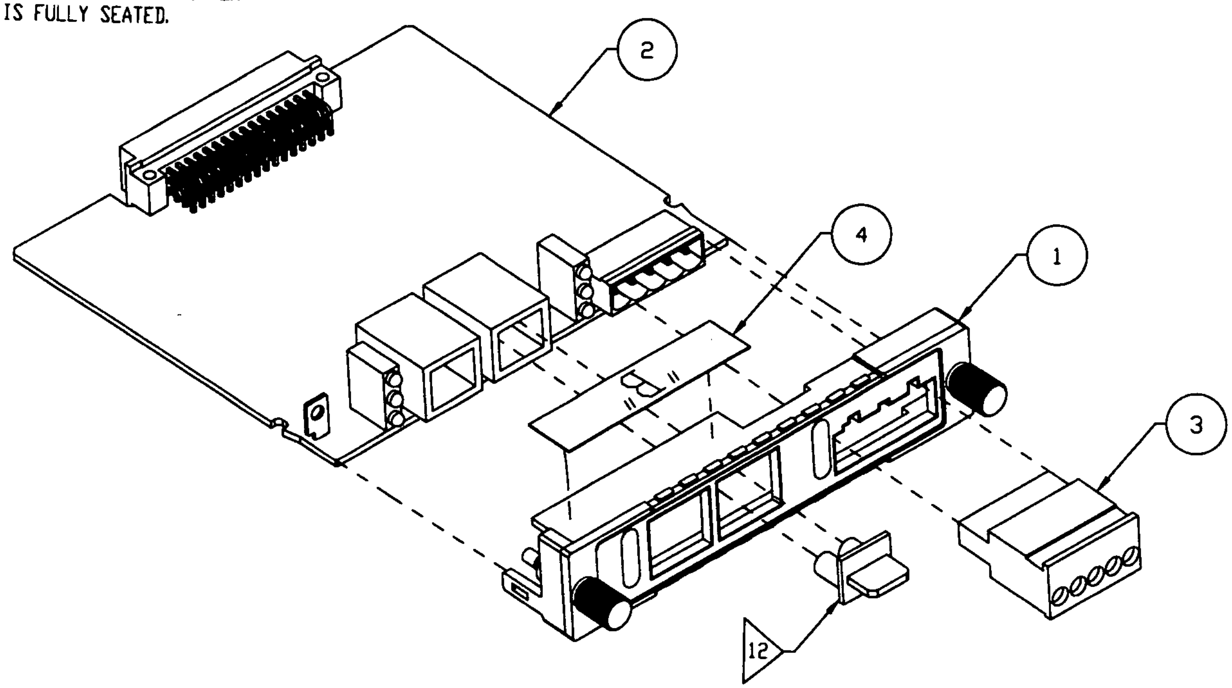
NOTES:

1. SNAP PCBA (ITEM 2) INTO SLOTS ON BEZEL ASSY (ITEM 1) AS SHOWN.
2. ATTACH 1 (ONE) ID LABEL (ITEM 4) IN LOCATION SHOWN. THE LETTER 'B' ORIENTS DIRECTION OF LABEL LETTERING. ID LABELS TO BE SIZED TO CLEARLY ACCEPT THE FOLLOWING INFORMATION:

   ECC21 H/W: XX F/W: YY
   S/N: MAC: ZZ-ZZ-ZZ-ZZ-ZZ-ZZ
   DOM:

   XX IS THE CURRENTLY MANUFACTURED H/W NO. OF THIS ASSEMBLY.
   YY IS THE CURRENT REVISION OF U5 FIRMWARE.
   ZZ-ZZ-ZZ-ZZ-ZZ-ZZ IS THE MAC#. FOR PROPER SERIES NO. OF THE MANUFACTURED ASSEMBLY, REFER TO SERIES CONTROL RECORD (ITEM 12). FOR PROPER REVISION NO. OF U5 FIRMWARE, REFER TO REVISION CONTROL RECORD 63230-002-195.
3. PRESS CONNECTOR (ITEM 3) INTO MATING CONNECTOR ON PCBA MAKING SURE CONNECTOR IS FULLY SEATED.

NOTES CONT'D ON SHEET 2



REV.	ECN NO.	DATE	BY
A2	PH00120	9/00	JF
A3	PH01049	4/01	JF
A4	PH01134	9/01	JF
A5	PH0415X(2)	11/04	JF

DO NOT SCALE-WORK TO DIMENSIONS

STANDARD TOLERANCES UNLESS OTHERWISE SPECIFIED

APPROVALS: DRAWN C. GRAFF — DATE 7/11/00

63230 304 100 A05 01

TITLE: ECC - FINAL ASSY

SQUARE D COMPANY

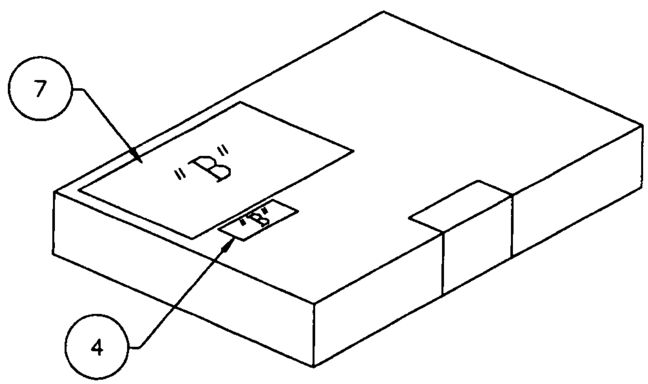
PART NO. 63230-304-100

SHEET	SCALE	REV
1 OF 3	N/A	A5

05/25/00

NOTES CONT'D:

4. DETAILED ASSEMBLY INSTRUCTIONS ARE THE RESPONSIBILITY OF THE MANUFACTURING ENTITY.
5.
6.
7. ATTACH TWO (2) ID LABELS (ITEM 4) TO REGISTRATION CARD (ITEM 11) WHERE INDICATED AND PLACE ON TOP OF INSTRUCTION BULLETIN.
8. CLOSE AND SEAL CARTON.
9. ATTACH CARTON LABEL (ITEM 7) ONTO CARTON WHERE SHOWN. THE LETTER 'B' ORIENTS DIRECTION OF LABEL LETTERING.
10. ATTACH ONE (1) ID LABEL (ITEM 4) ONTO CARTON WHERE SHOWN AND ONE (1) ID LABEL (ITEM 4) INTO LOGBOOK.
11.
12. THE PCB ASSY (ITEM 1) IS PROVIDED WITH A RUBBER/ELASTOMERIC DUST 'PLUG' IN THE ETHERNET FIBER CONNECTOR/PORT. THIS PLUG CAN BE REMOVED AND SET ASIDE DURING THE ASSEMBLY PROCESS AND SHALL BE RE-INSERTED PRIOR TO BOXING-UP THE UNIT.



APPROVALS	DATE	TITLE	
DRAWN C. GRAFF	7/11/00	ECC - FINAL ASSY	SQUARE D COMPANY, LAVERGNE, TENNESSEE, U.S.A.
CHECKED			
FILENAME 63230_304_100_A05_02		PART NO. 63230-304-100	SHEET 2 OF 3 / SCALE N/A / REV A5

04/12/00